

# Chemical Age

**D.S.I.R. ANNUAL  
REPORT**  
(page 911)

VOL. 83 No. 2134

**4 June 1960**

THE WEEKLY NEWSPAPER OF THE CHEMICAL INDUSTRY

## For the heating or cooling of all these chemicals — and many more

Acetic acid solutions  
Acetic acid and vinyl acetate mixtures  
Acetic acid and acetic anhydride mixtures  
Acetone solutions  
Ammonia solutions  
Ammonium sulphate solutions  
Ammonium phosphate (dibasic)  
Beet Sugar juice (raw)  
Brine  
Chlorinated Brine  
Calcium lactate  
Caustic soda solutions  
Colloidal solutions  
Crotonaldehyde  
Diphtheria plasma

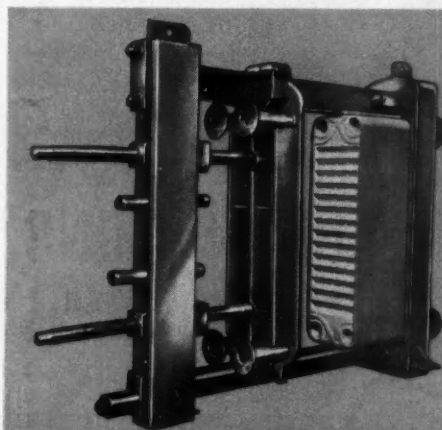
Effluents from—  
ammonia stills  
bottle washing machines  
cellulose bleacheries  
dye liquor vats  
glue making  
laundries  
solvent recovery plants, etc.  
Ethyl alcohol  
Formaldehyde solutions  
Glycerine solutions  
Gelatine solutions  
Glucose solutions  
Latex  
Lead fluoborate  
Lime slurry  
Metal polishes  
Methyl alcohol

n-Methyl pyrrolidone  
Molasses solution  
Oils—  
cottonseed  
linseed  
gas (debenzylised mineral type)  
hydraulic  
lubricating (turbines)  
mineral (various)  
quenching  
Oleic acid  
Petrolagar emulsion  
Phosphoric acid solutions  
Photographic developer solutions  
Poly-vinyl acetate emulsion  
Potassium carbonate lye  
Sodium aluminate solutions  
Sodium hypochlorite solution

Starch suspension  
Stearic acid  
Stoddarts Solution  
Sucrose solution  
Sulphur dioxide solution (dilute)  
Sulphite cooking acid  
Sulphite waste liquor  
Waters—  
boiler feed  
distilled  
demineralised  
engine cooling jacket  
Wax emulsions (thick)  
Whisky (Scotch)  
White Spirit  
Worts (various)  
Yeast cream

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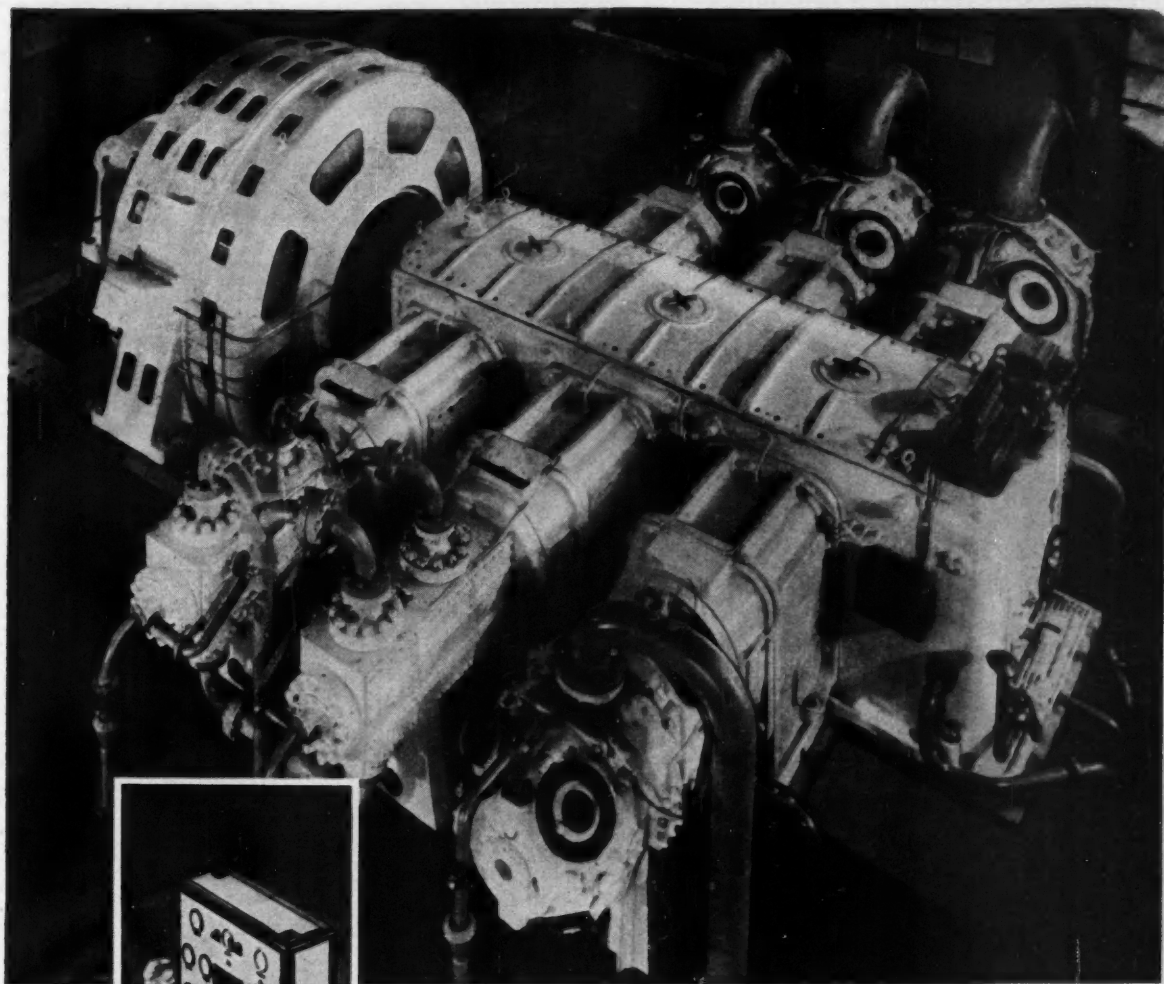
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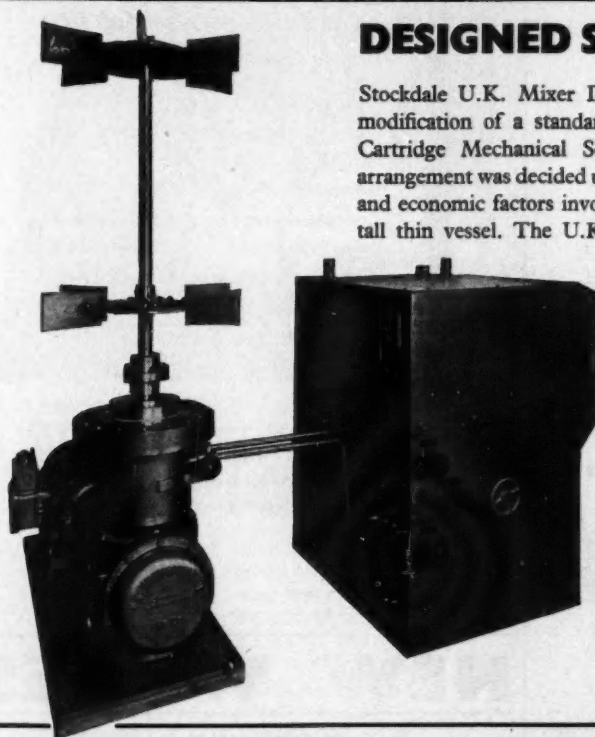
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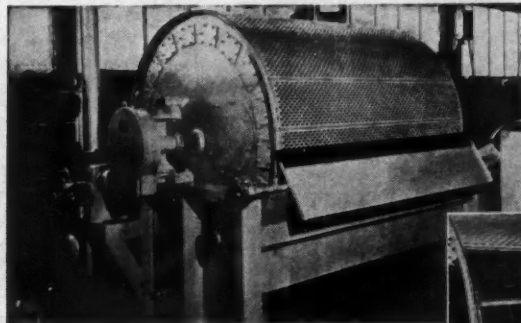


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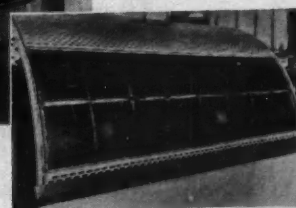
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Stockdale filter for saturated salt solutions. Inset photograph shows deep cell construction.



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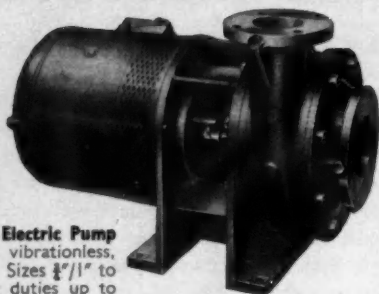
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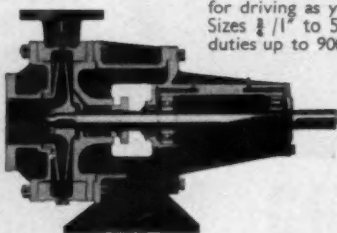


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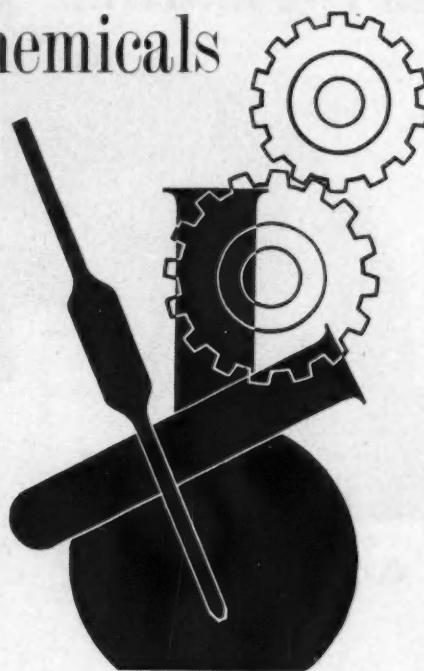
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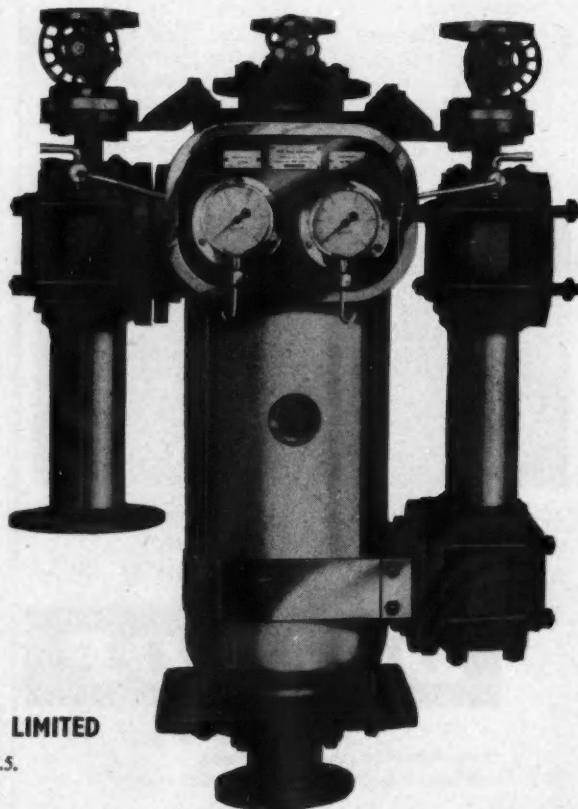
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In fact, it is the Analytical Chemist's ceaseless search for improved techniques that makes these higher standards realistic, as no legislation or published standard can itself ensure purity unless an analytical method exists which is sufficiently sensitive and accurate on all occasions, and for which there is the instrument aid available to make it practically useful. For companies engaged in the development of instruments aimed at making the Analytical Chemist's task lighter, it is very difficult to talk to enough people in the field to find out what is nearest and dearest to their hearts in this respect. However, Southern Instruments Limited of Camberley have set themselves this task and have recruited a team to tackle it. Initially concentrating in the electro-chemical field, this company is building up a range of aids which will be designed to provide the benefits of convenient operation, saving in time and money, and the employment of staff appropriate to the job in question. Their fully equipped laboratory led by J. Hetman, F.R.I.C. is constantly and confidentially dealing with a vast range of Analytical matters for Analysts who feel for example, that Polarography may have advantages to offer them. This enables the chemist to be fully satisfied that his requirements are met beforehand. This service is free, and open to anyone, and whilst it is not claimed that Southern Instruments know all the answers, they do know many of them. Future electro-chemical products will also be backed by an Applications Advisory Service.

Conscious of the absolute necessity of instruments embodying chemist user requirements, Southern Instruments have appointed Mr. H. M. Davis B.Sc., A.R.I.C. A. Inst. P. as Chief Engineer, Analytical Instruments Department. Well known for his design of the Cathode Ray Polarograph when at the Ministry of Supply, Mr. Davis now leaves the United Kingdom Atomic Energy Authority Research Group at Woolwich to take his unusual combination of chemistry, physics and electronics to Camberley. Southern Instruments wants to hear from any Analyst who has ideas about the Service and products he requires from Instrument companies and who is conscious of a desire to look into alternative methods of analysis, routine or otherwise.

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# CHEMICAL AGE

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## EXCHEQUER AND RESEARCH

**T**HERE are three central themes to the report of the Research Council of the Department of Scientific and Industrial Research, for 1959. The first is the steady expansion of the D.S.I.R. work on its second five-year plan, of which 1959 was the first year. This trend is particularly marked in aid for special researches and postgraduate training at universities and colleges of technology.

Second theme is the consolidation of changes made in previous years in the functions and organisation of some of the D.S.I.R. research stations. Third theme represents co-operation between the various research organisations with which the research council is concerned. This feature is likely to grow as the present and emerging needs of the U.K. for scientific and industrial research are identified and met.

In their previous report, the Research Council expected the rise in research grants—to be raised by three or four times over the period 1958-59 to 1963-64 for research outside nuclear physics—to be a gradual one. As things have turned out, in the first academic year of the period, 300 applications with a total value of about £2½ million were received, compared with 151 applications, totalling only £636,000 in the previous academic year.

This is a very welcome—although unexpected—trend, but the Council cannot yet assess the eventual rate of demand on its resources. However, following an assurance that it is maintaining its high standards, the Treasury has commendably taken a sympathetic view of the problem and has come to an arrangement which should enable D.S.I.R. to support all worthwhile applications. For 1958-59, 295 grants were made to a value of £2,232,000, compared with 163 awards, worth £1,090,000 in the previous year. Grants have been made to aid research projects for which no end point can at present be seen—in accordance with the scheme for longer-term support mentioned in the previous report.

The council has been attempting to strengthen the links between the D.S.I.R. research stations, the research organisations, the universities and colleges of advanced technology. This could have many practical benefits, particularly in making the fullest possible use of the available resources for research and in avoiding duplication of scientific effort. A research station can, for instance, place contracts with outside institutions for long-term research, which either fills gaps in its own research programme, or which provides a background to its own work, or which utilises special knowledge or facilities in an existing school of research.

During the year a development committee was set up to advise the Research Council on the scope for further support for industrial research and development. A joint committee has also been established between the D.S.I.R. and the National Research Development Corporation to examine development problems of common interest.

This fostering of links with industry is likely to prove most fruitful. It comes at a time when the Federation of British Industries is carrying out a survey into industrial research in the manufacturing industry. Although this survey repeats two of the questions of the recent D.S.I.R.



survey (See CHEMICAL AGE, 23 April, p. 673), it goes beyond that inquiry and seeks to establish the use made by industry of research associations, D.S.I.R. research stations, Government laboratories, universities, sponsored research organisations, consulting firms, etc.

A thorough survey of research and development activity in firms is being made and views of industry on research are sought. This F.B.I. survey should add much to our general knowledge of research and development in industry, even if it does not—as its authors freely acknowledge—provide a definitive statistical work on the research effort of industry. It should help the D.S.I.R. Research Council to identify the emerging needs of Britain for scientific and industrial research.

That the Research Council is fully aware of its new responsibilities in the nation's quickening interest in science and industry's growing participation in technological change is obvious from the conclusion of its report. It is acknowledged that D.S.I.R. must be able to mobilise its resources of manpower, money and specialised equipment in the most effective manner for industry and the nation, faced as they are with stiff world competition.

"Above all", says the report, "we must sustain the present acceleration of scientific and technical advance and see that progress is balanced between the needs of different industries and between important problems affecting the nation as a whole. In fact, a critical watch on events, with action where necessary to fill gaps and make good deficiencies, will be among the council's major pre-occupations in future years."

Since the Research Council was set up three years ago it has clearly proved its ability to take major decisions, some of which have been unpopular, in the general interests of rephrasing the work of the research stations in the light of changing conditions. Terms of reference of the stations have now been redefined in relation to modern needs.

This awareness of the Research Council of the vital contribution that D.S.I.R. and its research organisations have to make to modern industrial advance, coupled with the freeing of Treasury purse strings should give industry a lead so far as research and development is concerned.

### MATERIALS FOR PACKAGING

TWO new developments in the U.K. packaging field cover polypropylene film and polyvinylidene chloride (see CHEMICAL AGE, 28 May, p. 878). The I.C.I. subsidiary, British Visqueen claims to be first in the field in the U.K. in the production of polypropylene film, a claim that could be disputed by British Cellophane who displayed cast polypropylene at the Packaging Exhibition last September and who were making polypropylene film before that time. They are now also producing seamless blown polypropylene tube. For both companies this film is obviously a development product.

While the market for polypropylene film looks promising, the marketing specialists have been cautious. Estimates for the potential vary from 15% to 20% of the polythene film market. This year it is estimated that about 140,000 tons of polythene—more than 90% of which will be high-pressure product—will be used by U.K. film extruders. Thus polythene film will take about 11% of the estimated U.K. output of polythene in 1960 of 1,194,000 tons, of which 342,000 tons is expected to represent low-pressure polythene.

Although statistics on output of packaging film—including polythene, Cellophane and acetate film—are collected, these are not available for publication. It is clear, however, that polypropylene film will not make

great inroads into the polythene market, at least not for the present. The most useful advantage over polythene film is likely to be better clarity.

The Metal Box Co.'s Plastics Group is now producing a range of papers coated with polyvinylidene chloride, under the name Metacote. These papers will find a use in the packaging of powdered and granular products. The polyvinylidene chloride is imported by Metal Box, probably in the form of a dispersion, which can then be applied either to porous or non-porous materials. The final coated surface retains all the protective properties of polyvinylidene chloride film, such as water resistance very low transmission of gases and chemical inertness.

Polyvinylidene chloride is not made in this country, and the principal producers are the Dow Chemical Co., whose product is well known as Saran. National Starch and Chemical of the U.S. have experimental quantities of the material available as a water-based latex and by the autumn will have a plant at Meredosia, Ill., with an initial capacity of 14 million lb. a year. Their latex, Resyn 3600, will be sold as a dispersion with 50% solids and will be priced at 45 cents/lb. on a dry basis.

National Starch see their main markets in food packaging, while for industrial uses, the product can be coated on surfaces such as kraft paper and corrugated liner board. Among other end uses are fibre drums, multiwall paper sacks, labels, water-resistant tapes, stencil paper, etc.

### RUBBER CHEMICALS FROM LIGNITE

LIGNITE has been economically processed by scientists at the Battelle Memorial Institute, Columbus, Ohio, to yield 1,000 gall./day of tar which contains potential plasticisers and antioxidants for natural and synthetic rubber. This new source of low cost rubber chemicals is obtained by a method based on extraction and distillation.

The most promising derivatives are of two classes. One, (HBMS), extracted from lignite by methyl alcohol, compares favourably with standard antioxidants. The other, HBHS, is obtained with solvent hexane. The hexane fraction, which is effective both as an antioxidant and a plasticiser, can also be blended with the methanol chemicals to obtain an optimum balance of aged rubber physical properties.

The methanol chemicals are said to be comparable to two commercial antioxidants with respect to their effects on tensile strength and elongation of rubber. After four days of ageing tests, 5 and 10 parts of methanol fractions per hundred parts of natural rubber were found equal in these properties to 2 parts per hundred of PBNA (phenyl-beta-naphthylamine) and DBPC (di-tert-butyl-paracresol).

Blends of hexanes appear to offer the greatest promise as plasticisers. Hexane soluble fractions—both high and medium boiling fractions—are fully compatible at levels of 10, 20 and 30 parts per hundred and easily incorporated into SBR-15000.

While the composition and properties of the products were carefully controlled in production, it is possible to adjust operation conditions to tailor-made fractions with differing boiling points or other physical characterisations. By blending methanol solubles and hexane solubles, it also is possible to obtain products with intermediate chemical composition. All of the studies made with lignite tar fractions indicate that these materials have a high degree of compatibility with rubber.

The majority of the studies was conducted with lignite tar fractions produced in a small-scale pilot plant at Battelle. Verification of the work also was carried out with similar fractions produced in a prototype solvent extraction at Rockdale, Tex, capable of processing 1,000 gallons of tar a day.

## Project News

# Yugoslavia Polythene Contract for Simon-Carves

A CONTRACT similar to that for the erection of a polythene plant for Petroleos Mexicanos ('Project News', 12 March, p. 445) has been granted to Simon-Carves in respect of Yugoslavia. Simon-Carves work in close conjunction with I.C.I., who have for some years licensed their polythene process to overseas countries. In addition to the Yugoslav project, enquiries are also being handled for polythene plants for prospective I.C.I. licensees in South Africa, Rumania, Poland and Czechoslovakia.

In his annual statement, Mr. R. B. Potter, chairman of Simon-Carves, declared that among projects under discussion for I.C.I. overseas subsidiaries is an extension of the polythene unit designed and built by Simon-Carves for the Indian company.

The £2.5 million fertiliser contract, obtained from the East India Distilleries and Sugar Factories Ltd., in which the credit facilities offered played an important part, will, thinks Mr. Potter, prove the first of many similar plants, particularly in India, where compound fertiliser production is essential to the country's economic planning.

● A CONTRACT has been awarded to Chemical Construction (G.B.) Ltd. for a 376 tonnes/day sulphur burning sulphuric acid plant for Greece. This will be the country's largest single-unit sulphuric acid plant. Chemco will furnish the design, engineering, equipment and supervision of construction and initial operation of this plant. It is to be erected at Ptolemais, in the northern part of Greece, for the Greek Ministries of Industry and Co-ordination, as part of a large nitrogenous fertiliser factory.

● Now being commissioned at the Wakefield works of A.C.C. (Brotherton) Ltd., a member of the Associated Chemical Companies Ltd. group, is a new plant for the manufacture of organic chemicals that was designed and constructed by A.C.C. (Brotherton) themselves. Unit processes that can be performed on the plant include oxidation and reduction, sulphonation and nitration, ethoxylation and chlorination, alkylation, etc. Industrial detergents and photographic chemicals now being manufactured by the subsidiary, Stockport United Chemical, will be transferred to the new plant in July. New organic chemicals scheduled for immediate production at Wakefield include products for the plastics and pesticides trades.

● A SHARP rise in production and sale of Isceon, fluorine-based chemical for aerosol propellants and refrigerants, and rapidly increasing demand for aerosol

propellants, which promises continued increases in sales in 1960, has led to plant extensions now under construction at the Avonmouth plant of Imperial Smelting. These follow the plant brought into operation last year and which is already working at full capacity. (See also 'Overseas News', p. 920.)

Imperial Smelting also have under construction additional plant for hydrofluoric acid to meet rising sales; production in 1959 was 30% up on the previous year.

Both projects are being handled by the

company and they will be completed before the end of the year.

● WILLIAM Boby and Co. Ltd., Rickmansworth, Herts, have been awarded a contract by Courtaulds, valued at "several thousand pounds", for a pilot demineralisation plant, for export to U.S.S.R.

● As part of the £180,000 effluent system at the Monsanto Works, Newport, Mon, two 18 in. diameter pipes have been laid under the Bristol Channel extending for half a mile. The scheme, which has been described as a big technical advance towards beating the pollution of beaches, will remove treated effluent from the works for the next 20 years and will begin operating in October. At present the existing outlet discharges only 1 million gall. a day into the mouth of the Usk; under the new system the effluent will be treated and discharged into the Channel at the rate of 4 million gall./day.

## Two Chemical Engineering Firms Get U.K.A.E.A. Collaboration

FIRST two British chemical engineering firms to benefit from collaboration and licence agreements with the United Kingdom Atomic Energy Authority, which will help them to compete for export business in the design and manufacture of radioactive chemical-processing plant, are W. J. Fraser and Co. Ltd. and Nuclear Chemical Plant Ltd. (the company formed in 1958 by the Power-Gas Corporation Ltd., Humphreys and Glasgow Ltd., and John Thompson Ltd.). Agreements signed between the U.K.A.E.A. and these two companies on May 27, are the first of their kind since the Authority's decision in 1957 to collaborate with members of the British Chemical Plant Manufacturers' Association who wished to enter the nuclear chemical field.

The agreements are the outcome of negotiations with the Authority by the two companies and the signing in August 1958 of training agreements under which

selected technical staff were sent by each company to the Authority for training in the design and operation of chemical plants in the nuclear field. The collaboration and licence agreements now concluded cover plant and processes connected with the production of uranium metal billets from uranium ore concentrates and the reprocessing of irradiated nuclear fuel elements. There are provisions for extending the scope of the agreements from time to time.

Under the agreements, the Authority provide in return for royalties: (1) a licence to the companies under the Authority's wide patent cover in the nuclear chemical field; (2) general advice on technical problems; (3) assistance in commissioning and specialised training relating to the particular plants to be built by the companies; (4) further training, when required, of the companies' technical staff; and (5) information on current and future significant work in the field.

## I.C.I.'s £1 Million Fertiliser Price Cuts

PRICES of all fertilisers produced by I.C.I. are to be reduced from 1 July. The reductions will represent a saving to British agriculture of not far short of £1 million in 1960-61. Price cuts range from £1 to 5s per ton throughout the season 1960-61.

The reductions are based partly on increased sales in the 1959-60 season and the company's confidence in the expanding use of fertilisers in the coming year, and partly on improved methods of production and the advantages accruing from operating I.C.I.'s new fertiliser plants at higher rates of output.

None of the raw materials is expected to be cheaper in 1960-61, and labour costs are unlikely to fall.

## Symposium on Pressure Vessel Research

IN collaboration with the British Welding Research Association, the Institution of Mechanical Engineers is to organise a symposium on 'Pressure vessel research towards better design' in London on 18 January 1961, when about twelve papers covering research and design will be discussed during the one-day meeting. The research papers and discussions will take pressure vessel components into account, and attention will be directed to problems concerning pressure vessel nozzles. In the design session, papers will include comparisons of continental and British practices and of design codes, and an outline will be given of some of the difficulties associated with the design of pressure vessels for I.t. operation.



# DISTILLATES

★ ADVANTAGES of the thermal process for the production of elemental phosphorus over the wet process, despite the high cost of power, was amply demonstrated when I visited the Portishead works of Albright and Wilson last week. The six furnaces, which are allowed to go out only when the carbon hearth needs replacing, ensures a continuous production of 99.99% phosphorus.

Out of the 266 employees at Portishead, only 25% are concerned with the actual process and operation, the rest being mainly maintenance staff. A system of conveyor belts, electrically controlled weighing, etc., make the process a highly automatic one from the unloading of the phosphate rock by pneumatic handling plants to the pumping of the phosphorus into storage tanks to await despatch by road and rail tankers.

Most of the Albright and Wilson phosphorus (some 30 million lb./year), and in fact practically the whole of the U.K. total, is produced at Portishead, and is sent to other A. and W. factories for the manufacture of pure phosphoric acid and high-grade phosphates.

★ THE recent judgment of Mr. Justice Pennycuik in the Chancery Division that payments to Rolls-Royce for know-how arose from the sale of a capital asset and are excluded from the company's profits will be of interest to many industries. Four appeals by the Crown against decisions of the Special Commissioners allowing appeals by Rolls-Royce against assessments to income tax, excess profits tax, profits tax and excess profits levy arising from the sale of technical knowledge, were allowed with costs.

The judge said that the company had contended that it had never been its policy to make inventions and discover secret processes with a view to earning profits by realising its rights in them. The vast store of knowledge and secret information thus acquired was a fixed capital asset. The transactions, declared the judge, represented a disposition of part of the company's capital assets and it followed that any payment made in respect of it was not to be brought into account in computing revenue profits.

★ CHEMICAL industry hopes for a successful outcome to the talks between the 'outer seven' and 'the six', due to begin on 9 June, will doubtless be tempered by caution in the light of experience. The result must largely depend on the attitude of individual members of the European Economic Community. A

change in the U.K. Government's attitude on entering a new agreement, perhaps a Customs Union, is now thought likely in lobby circles.

On Monday, Mr. Harold Macmillan thought the prospective negotiations between the 'seven' and the 'six' to be "more urgent, but perhaps less difficult," because of the Summit failure. He pointed out that the approach had recently come from the Common Market (a hopeful sign) and he mentioned the spirit in which the 'seven' had responded to the invitation.

The U.K. cannot contribute to a solution by adopting sudden and unexpected changes or by abandoning old or new friends, said the Prime Minister. Neither the Commonwealth nor the more recent association with the 'seven' can be abandoned, but at the recent Commonwealth Prime Ministers' conference, the Commonwealth countries made it clear that they are also anxious for a European trade settlement.

★ ALLEGATIONS that an ammonia plant failed to operate satisfactorily have been made by the Taiwan Fertiliser Co., Formosa, against Hydrocarbon Research Inc., New York, who engineered and supervised construction of the plant. The Formosan company has filed a £10.7 million law suit against the New York firm, according to the latest edition of *Nitrogen*, the quarterly journal of the British Sulphur Corporation. The ammonia synthesis plant with a 100 tons/day capacity was completed over two years ago at Nankong as part of a urea fertiliser works.

The urea installations, with a capacity of 84,000 tons/year and engineered by Vulcan Copper and Supp'y Co., under an Inventa licence, are said to have produced less than 3,000 tons of urea, instead of a planned 128,000 tons. This is alleged to be due to the failure of the ammonia unit to operate continuously.

Any failure on the part of the plant is stated by Hydrocarbon Research to have been due to factors outside their control, particularly to a lack of experienced maintenance and operating personnel, shortage of electric power and to typhoons.

★ To the three U.S. firms who are to produce polydiene rubbers comes another—Goodyear, who are to start building immediately a plant for polyisoprene and polybutadiene near Beaumont, Tex. Production is expected in about a year. Capacity figures have not been published, but total of the other three is 60-65,000 tons/year of these rubbers. Shell Chemical are setting up a 15-20,000

tons a year plant at Torrance, Cal, for polyisoprene; Phillips Chemical, are building a 20,000 tons/year polybutadiene plant and Goodrich-Gulf have plans for a 25,000 tons/year plant for polyisoprene and *cis*-polybutadiene. All these U.S. plants are scheduled for completion by 1960 and 1961 (see also *CHEMICAL AGE*, 2 April, p. 562).

In the U.K., Shell Chemical are to make polydiene rubbers and while no definite on-stream date has been given, it has been suggested for 1962-63. I find this difficult to believe, since Shell Chemical themselves give a development period of three years before coming on to the market. Their project must have been under discussion and in the design stage for some time past.

Even so, with a few notable exceptions—and the I.C.I. polypropylene plant ranks as one—it seems that the U.S. industry can get major plants up quicker than is the case here.

★ WITH strong feelings on the sale of highly flammable materials, particularly for children's clothes, I welcomed the parliamentary statement in an adjournment debate on Monday evening (see p. 914). Not only did Mr. John Rodgers of the B.O.T. acknowledge the costly research effort that has gone into the development of flame-resistant processes, he also referred to the new Proban process that has now overcome the textile trade's objections that previous processes adversely affected the 'feel' of treated fabrics.

One chain store that has for long refused to sell cotton nightdresses for children—Marks and Spencer, who maintain a vigorous research and testing station—now feel that the new process is satisfactory on all counts and will soon have clothing made up from treated fabrics on sale throughout the country.

★ THE Esso Bill by which Esso Petroleum seek parliamentary powers to build pipelines from Fawley to Avonmouth to supply ethylene to the new I.C.I. Severnside Works, has come up against unexpected opposition. Similar Bills have already been approved for the British Petroleum pipeline from the Finant oil terminal to Grangemouth refinery and for Shell, from the Stanlow refinery to Carrington.

Opposition from those whose property will be disturbed was naturally to be expected. Opposing county councils have said that the pipelines would "transverse and effectively sterilise" extensive areas within their counties and they have petitioned for a number of safeguards. *The Times* reports one of the objectors, Sir Eric Errington, as demanding provision for notifying people who would be affected by the pipelines and dealing with their objections on the lines of the legislation passed last century when the railway lines were being laid throughout the country.

*Alembic*



## Treasury Agrees to Meet D.S.I.R.'s Big Increase in Applications for Research Grants

ONE of the salient features of the Report for 1959 of the Research Council of the Department of Scientific and Industrial Research (H.M.S.O., 4s 6d net) is a big and sudden increase in applications for research grants. In the first academic year of the second five-year plan from 1958-59 to 1963-64, 300 applications were received valued at about £2½ million (151 applications totalling £636,000).

Financial provision for research grants has not been sufficient to support all the applications of high enough merit. Although the Research Council has found it difficult to assess the eventual rate of demand on its resources, the Treasury—on an assurance that the present high standards will be maintained—has agreed, without prejudicing the rest of the five-year plan, that D.S.I.R. may enter into commitments for grants at a substantially higher level than was possible under the plan. The Treasury has also agreed that the situation can be reviewed even in 1959-60 if the present level of resources seems to be restrictive.

The Research Council say that this arrangement should enable it to support all available applications. For 1958-59, the final total of grants made was 295, at a value of £2,232,000 (163 grants worth £1,090,000).

### Postgraduate Awards

The year also saw a "smooth and steady expansion" of awards for postgraduate training. The number of new research studentships taken up has risen by a fifth from 777 in the previous year to 928. The total number of studentships, both new and continuing, stood at 2,144 in October, 1959, compared with 1,681 a year earlier.

The Council's survey of present and projected research at the research stations has been completed and no changes were made in either organisation or scope of the work in the past year. This review, however, led the council to reconsider the broad aims and functions of the stations and to redefine their terms of reference clearly and in relation to modern needs.

Basic research in the stations must be directed to the general advancement of technology and applied science, it is stated. The council recognises, however, that each station should have the freedom to follow up new ideas that fall within its field of interest and so to include some research that is not directed towards any immediate need of industry or Government. In considering their programmes, stations must take into account both the ability and responsibility of industry and research associations for organising applied research, also

the scope of related work in universities and colleges of technology.

Each station has before it a limited number of clearly defined objectives, chosen to yield, if attained, the maximum national advantage from the resources available for research. Research projects are limited in number so that proper progress can be made on each. The council believes that it is becoming increasingly important for the stations to disseminate the results of research and to secure their application.

As a result of the council's decision last year that the National Chemical Laboratory should concentrate its resources on a limited number of object-

ives, it is devoting a greater proportion of its effort to the determination of fundamental thermodynamic and thermochemical data and other physico-chemical constants of pure material. At the N.C.L. effort is distributed as follows: extraction of metals, 31%; corrosion of metals, 13%; preparation and properties of pure elements and compounds, 22%; development and application of new materials, 18%; analytical research and services, 16%.

Distribution of effort at the Government Chemist's Laboratory is as follows: work concerned with revenue control, 47%; general analytical work, 23%; food, drugs and agricultural chemicals, 19%; research and development, 11%. Warren Spring Laboratory: atmospheric pollution, 19%; process development, 19%; mineral processing, 40%; chemical engineering, 19%; human sciences, 3%. Water Pollution Research Laboratory: treatment of water, 2%; treatment of polluting liquids—sewage and industrial wastes, 53%; sewage only, 5%; industrial wastes only, 5%; effects of pollution on natural waters, 35%.

## I.C.I. Produce Diquat Non-arsenical Potato Haulm Destroyer

MANUFACTURE of a new, non-arsenical chemical, Reglone, which destroys potato haulm without danger to human beings and livestock, has been started by the Dyestuffs Division of Imperial Chemical Industries Ltd., at their Huddersfield works. Active ingredient of Reglone is diquat—a new quaternary ammonium compound first prepared and patented by I.C.I. Its haulm-destroying qualities were discovered in 1955 and since that time it

has been tested and developed extensively in field trials.

The new chemical, which will be available to farmers this season, results from work by I.C.I. and Plant Protection Ltd., at Jealott's Hill and Fernhurst research stations, aimed at finding a haulm destroyer which is as efficient as arsenic, is safe to use, and can be applied by farmers' own spraying machines.

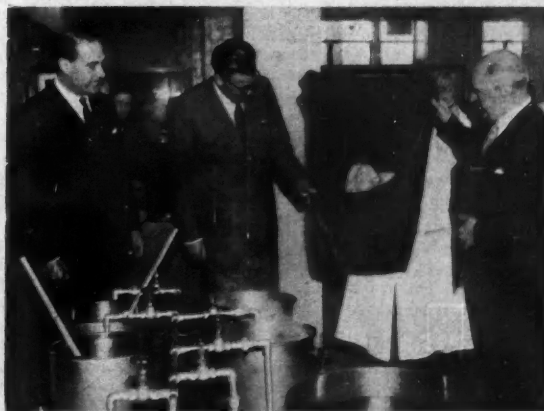
Reglone is produced as a concentrated liquid which is readily mixed with water.

## New CIBA Clayton Laboratories Will Advance Fabric Finishing Techniques

THE need for discovering new finishes and improved methods of colour application if the British textile industry is to compete successfully in the export market was stressed by speakers at a luncheon in Manchester, following the official opening of CIBA Clayton's new research laboratories on 24 May (see

CHEMICAL AGE, 28 May, p. 875).

The three-storey laboratory block cost £500,000 to build and will employ upwards of 100 specialists. It will enable CIBA Clayton Ltd. to expand the scope of their research on the shrink resistance and flameproofing of fabrics and to extend their technical service



Seen here in the new CIBA Clayton laboratories are (left to right): Sir Arthur Vere Harvey, M.P., chairman of the CIBA Group in the U.K.; the Earl of Derby, who presided at the opening ceremony; and Mr. J. G. Grundy, the company's chief colourist

## Sir Harry Melville Reviews 25 Years of Man-made Fibres

### Textile Institute Jubilee Conference

**W**HILE nylon and Terylene were the result of systematic research and fortunate observation, the development of acrylic fibres was on quite a different basis, declared Sir Harry Melville, K.C.B., F.R.S., secretary of the Department and Scientific Industrial Research on Monday. He was speaking on 'Twenty-five years of man-made fibres' at the jubilee conference of the Textile Institute, held in Church House, London S.W.1 from 30 May to 3 June. The conference was opened by the president, the Earl of Derby.

Sir Harry declared that when polyacrylonitrile was developed it could not be spun because no suitable solvent was available and it could not be melt spun because of its chemical decomposition. With the development of solvents, the most successful being the highly toxic dimethyl formamide, progress was comparatively rapid.

The big drawback with polyvinyl alcohol was its solubility in water. Japanese chemists had worked for some time to overcome that disability by substituting some of the -OH groups by other structures.

There was still much scope for improving the methods of synthesising polymers and of spinning the fibre. That might lead to a reduction in cost and to the possibility of new kinds of polymer structure being used for fibre forming materials.

### Interfacial Polymerisation

One recent development was that of interfacial polymerisation at room temperature or slightly above. The principle was that a hydrophobic liquid was floated on water and one reactant was dissolved in the aqueous phase and the other in the upper hydrophobic phase. Those interacted readily interfacially, forming a skin of polymer. The most important matter was that a whole series of new kinds of polymers became available in addition to all the possible modifications of polyamides and polyesters that could be imagined.

Random copolymers, whether polyamides or polyesters, were easy to prepare, but block copolymers or even mechanical mixtures were out of the question because *trans* amidation or esterification occurred in the molten polymer when it was spun. With interfacial polymerisation that could not occur.

Six years ago a new type of catalyst was discovered which was powerful enough to polymerise ethylene at room temperature. The polythene so produced had a melting point about 10° above that of the product produced at high temperatures. These new catalysts were formed by Natta to polymerise  $\alpha$ -olefines, in particular propylene. Those products

proved highly crystalline and they would form fibres on cold drawing giving tenacities as much as 10 grammes per denier. The important point about such products was that they were stereo-regular.

Intensive research led to the development of a great variety of catalysts of a similar type which would polymerise monomers like acrylonitrile, styrene, etc., to form stereo-regular polymers—lithium alkyls were notable in that respect. Those polymers had a much higher melting point than the glass-like non-regular

polymers. There was as yet insufficient information about the fibre-forming properties of such polymers. There was here great scope for much development.

Sir Harry declared: "If new fibres are to make any headway they have to exhibit outstanding properties in one or more directions, but one—tenacity—has to be high, apart from all others. The outstanding fact is that although the chemical structure may vary, the maximum attainable strength is not very different. If tenacity depends upon interatomic forces or upon a great multiplicity of intermolecular bonds, such as would occur between closely aligned molecules, it seems likely that some increase could still be achieved with existing chemically similar materials."

## Prof. Speakman Calls for New Approach to Research on Structure of Wool

**T**HE fifty years that had elapsed since the Textile Institute was formed could be described as the golden age of fibre science, said Professor J. B. Speakman (Leeds University) in his paper 'The chemistry of protein fibres' given at the jubilee conference. During the period there had been a succession of advances along three main fronts: X-ray examination of the fine structure of the chief natural fibres, physico-chemical studies of polymerisation processes and the development and use of the new chromatographic techniques for the amino-acid analysis of protein fibres. Recent rapid advances in protein chemistry would hardly have been possible without the invention of the powerful technique of paper chromatography.

In the paper chief attention is given to silk and wool. Silk was considered first "not merely because its constitution is less complex than that of wool, but rather because the main principle underlying recent rapid progress in determining the sequence of amino-acids in fibroin should provide a basis for similar work and aniline or serine."

In order to study the composition of fibroin it has been necessary first to carry out a complete amino-acid analysis and then study the amino-acid sequence in the crystalline regions of fibroin. "The simple relationship between the composition of fibroin and its elastic properties is readily understood if the more easily extended, disordered regions of fibroin are rich in the amino-acids with long side-chains, while the well-oriented polypeptide chains in the crystalline regions consist of alternating residues of glycine and aniline or serine."

A very close understanding of the crystalline regions of fibroin had been obtained, and further investigations on fractions of fibroin isolated by means of other enzymes were likely before long to provide a complete understanding of the constitution of the silk molecule. The present tentative picture was that the chain molecules of fibroin, having a mole-

cular weight of 84,000, consisted of alternate sections with average molecular weights of 4,000 and 3,000, the former giving the crystalline regions and the latter the amorphous regions.

Referring to wool, Professor Speakman spoke of recently developed methods for imparting permanent creases and pleats, a permanent lustre, and washable seersucker effects to all-wool fabrics. Early recognition of the importance of cross-linking reactions in setting processes had led to a general study of cross-linking reactions in keratin.

Usefulness of the skeleton model was gradually being exhausted, however, and further advances must be based on more precise knowledge of the proteins present in keratin and the arrangement of amino-acids in them. Chromatographic techniques had been used to obtain complete amino-acid analysis of typical wools. Those, however, were limited in value because the results represented merely average values for the wide range of proteins present in the fibre.

There was a definite need for a new approach if precise relationships between structure and properties were to be established. One such approach was based on differences of accessibility of the crystalline and amorphous regions of the fibre. Methods of that kind should provide the more exact knowledge of the constitution of keratin which was needed to inaugurate a new era in wool research."

### Manchester Symposium on Use of Textile Chemicals

'Chemicals—their use and application in textile finishing' is the title of a symposium which is being arranged for 23 September, to be held in the Free Trade Hall, Manchester, jointly with the first international textile dyestuffs, finishes and auxiliaries' exhibition, to be held on 22 and 23 September.



## Automatic Control in Mineral Processing

A PAPER entitled "Automatic control in mineral processing," presented by Mr. M. J. Cahalan (Rio Tinto Management Services (U.K.) Ltd.), and Mr. R. Wolski (Elliott Brothers (London) Ltd.), at a recent International Mineral Processing Congress, summarises a theoretical investigation carried out on the application of automation to mineral processing with a view to establishing to what extent the techniques of automation could usefully be applied in this field.

The paper discusses the use of sensing elements, automatic analysis and quality control, computers and actuating equipment are discussed. During the course of the studies leading to the paper, mechanical, electrical, electronic and chemical engineering specialists were consulted as well as mining and metallurgical engineers. It is an example of the type of work performed by the systems engineer and the contribution he can make to the introduction of new techniques to established industries.

## Atomic Waste Disposal In Sea Not Recommended

RELEASE of highly radioactive wastes into the sea cannot be recommended as an operational practice, according to a committee set up by the International Atomic Energy Authority, though the sea disposal of wastes at low and intermediate activity may be safe under controlled and specified conditions.

Among several recommendations made by the committee is one that all authorities setting up disposal sites should supply a suitable international authority with information necessary to maintain adequate register of such wastes disposed at sea, and details of such a scheme are also described.

## Soviet Delegation to Discuss Trade Agreement

A delegation from the Soviet Union will be arriving in this country on 6 June to begin discussions with the Board of Trade about operation of the Anglo-Soviet Five Year Trade Agreement of May 1959.

## Week-End Course for Chemistry Teachers

To enable teachers of chemistry in secondary schools, colleges of further education and training colleges to meet and discuss the teaching of chemistry and to hear lectures connected with this science, are the aims of a weekend course at the City of Liverpool College of Technology.

Details of the course, scheduled for 1 and 2 July are available from the Department of Chemistry and Biology of the above college, Byrom Street, Liverpool 3.

## B.O.C. Acquire Management Training College

British Oxygen Co. Ltd. have purchased Chartridge Lodge, near Chesham, Bucks, for use as a management training college.

# Gas Board to Study Economics of New Gasification Process

A £225,000 pilot plant, to be built at the North Thames Gas Board's works at Bromley, East London, will be used to investigate the economics of a new complete gasification process for obtaining gas from low-grade coal. The plant will be operated as an experimental unit of the London Research Station of the Gas Council and it is expected to produce some 2 million cu. ft. of blue water gas per day, using a modification of the slag bath generator process developed in Germany from the invention of Herr Roland Rommel at the Union Kraftstoff A.G.

The contract for construction of the pilot plant has been placed with Simon-Carves Ltd., who are working in conjunction with Dr. C. Otto and Co. and Bochum, W. Germany. Work has already started and will be completed in about a year.

It is hoped that this plant will point the way to a process which will gasify the cheapest grades of coal completely, producing blue water gas on a large scale at the lowest possible cost. This cheap blue water gas would be mixed with a cheap rich gas—such as imported methane, gas obtained from oil gasification or tail gases from refineries—to provide town gas at the statutory calorific value.

The process involves forcing powdered coal together with air or oxygen and steam into a bed of molten slag which

produces blue water gas continuously. In a somewhat different form, the process has been operated on a large scale in Germany using brown coal as a fuel. In this country, where there are no considerable quantities of brown coal, modification has been made and the pilot plant will utilise powdered low rank black coal as a fuel, and with air instead of oxygen. Because of this use of air the slag bath generator to be used in the Bromley pilot plant will consist of a twin shaft system and a divided slag bath, in one part of which coal is burned in air with combustion products escaping up one of the shafts. In the other part, coal will react with steam in the presence of molten slag heated by combustion in the first part of the bath to produce blue water gas. The molten slag will be kept circulating under a dividing curtain so that heat generated on the combustion side is carried into the gas-making side to provide the heat required for the process. This is a complete gasification process, there being no by-products except slag.

The desirability of such a process can be seen from the fact that it is now more expensive to manufacture 'lean' or low calorific gas in existing conventional plants than to produce rich or high calorific gas. It is essential, however, to have supplies of lean gas in order to reduce the calorific value of rich gases to a standard level.

## Ceramic UO<sub>2</sub> Fuel Elements for A.E.A.'s New Windscale A.G.R.

THE £9 million advanced gas cooled reactor (A.G.R.) at Windscale differs from the existing reactors of the Calder Hall type in its use of ceramic uranium dioxide instead of uranium metal as the fuel elements, and beryllium or stainless steel as the cladding material.

The new reactor is a prototype unit which will supply electricity to the national power supply as well as helping to solve certain technical problems associated with advanced reactors.

The choice of uranium dioxide as the fuel element is based on its high melting point, 2,800°C, and its ability to withstand high irradiation doses. Experiments are to be carried out on both beryllium and stainless steel cans under various conditions. Beryllium has a very low neutron absorption cross-section and a high thermal conductivity, but is a little-known material, whereas stainless steel, although a well-known material, has the disadvantages of a high neutron absorption cross-section and low thermal conductivity. The reactor incorporates five loop systems for the testing of fuel elements under more varied and advanced conditions than are possible in the reactor in order to obtain an operational lead on their performance.

The graphite core, arranged in a triangular lattice as opposed to the rect-

angular lattice of the Calder Hall reactor, is cooled by the incoming gas flowing through passages between the graphite bricks. The temperature of the graphite is sufficiently high to prevent the build up of Wigner energy, the release of which was the initial cause of the fire which made it necessary to close the Windscale No. 1 pile.

One of the main functions of A.G.R. is to provide for the large-scale testing of fuel elements so that a large amount of irradiation data will be available for the design of fuel elements for full-scale power reactors of this or a similar type. Selected fuel elements will be delivered to a laboratory with thick concrete walls equipped with zinc bromide windows (the cave), where all operations are carried out remotely, either by fully automatic machines or 'master-slave' manipulators. In the cave the fuel elements are broken down and subjected to intensive crystallographic and metallurgical examination.

Sir William Cook, Member for Development and Engineering, U.K. Atomic Energy Authority, said that great store was set by the advanced gas cooled reactor and it was considered to be a big step forward and will reduce capital costs and the unit cost of electricity.



**In Parliament****NEW PROBAN PROCESS OVERCOMES TRADE COMPLAINTS ON HANDLING PROPERTIES**

**T**HERE are three processes that could render certain fabrics flame-resistant to the degree specified in the Fabrics (Misdescription) Regulations, declared Mr. John Rodgers, Parliamentary Secretary, Board of Trade, in an adjournment debate on Monday evening. The companies concerned had devoted a great deal of time and large sums to their development. It was only fair to add they had done so without any great response from the public.

Materials treated by those processes had been handled by various retailers in a manner that should have proved a fair test of demand. Public response was bitterly disappointing—"negligible" was the only word to describe it.

Mr. Rodgers then referred to a further technical development to at least one of the processes. Proban (a subsidiary of Albright and Wilson and the Bradford Dyers' Association) claimed that this virtually eliminated the adverse effect on 'handle'. If that were so, there then remained only the question of price. The process would add to the cost of, say, a nightgown for a small child, the price of 20 cigarettes.

For the last 10 years a large chain store had not sold cotton nightdresses for children on the grounds that they were too dangerous. After having tried and rejected a number of chemical treatments for cotton fabrics, they were now of the opinion that Proban's latest process was satisfactory from both the safety and 'fabric handle' angles. They had placed an order for several thousand yards of treated fabric and hoped to have nightdresses made from it on sale before long.

**Duty on Fertilisers**

Parliamentary Secretary to the Board of Trade, Mr. J. Rodgers, stated in a written answer on Monday that, during 1959, £31,602 was paid in import duty on 9,419 tons of superphosphates, and £82,468 on 105,808 tons of basic slag.

**Food Standards Committee Reconstituted in Autumn**

The Food Standards Committee of the Ministry of Agriculture has now been reconstituted, although the reconstitution will not become effective until the autumn, when the present committee completes its report on bread and flour. Mr. John Hare, Minister, in a written reply on 30 May gave the names of the new committee. The committee has been reconstituted to make it more independent and except for the Government Chemist's Department, which has special responsibilities under the Food and Drugs Act, Government Departments will no longer be represented on the committee. Under the chairmanship of Mr. R. Groves, M.A., B.Sc., F.R.I.C., Master of Dulwich College, the reconstituted com-

mittee is as follows:

**Trade Members:** Colin S. Dence, B.A. (managing director, Brand and Co.); A. Glover, O.B.E., M.Sc., F.R.I.C. (head of research department, Co-operative Wholesale Society); E. W. Graham Guest (director of MacVitties Guest and Co.).

**Scientific Members:** Professor B. S. Platt, C.M.G., M.Sc., M.B., Ch.B., Ph.D. (director, M.R.C. Human Nutrition Research Unit); R. W. Sutton, O.B.E., B.Sc., F.R.I.C., F.C.S. (Public Analyst for the county and borough of Derby); P. McGregor, B.Sc., F.R.I.C. (representing Government Chemist's Department).

**Independent Members:** C. A. Adams, C.B.E., B.Sc., F.R.I.C. Barrister-at-law (past vice-president, Society of Public Analysts; former assistant-secretary, Ministry of Food); Mrs. M. Carroll-Marx, M.B.E. (head of food department, W.V.S.); J. A. O'Keefe, O.B.E., B.Sc., L.I.B. (head of the public control department, Middlesex County Council).

**I.C.I. Named as Suppliers to U.K. A.E.A.**

Replying to a further question on the subject of the chemical supplied to the A.E.A. by a hitherto unnamed manufacturer, Sir David Eccles, Minister of Education, replying for the Minister of Science, named the Imperial Chemical Industries Ltd. as the manufacturer.

Earlier this month the £1½ million contract attracted comment from various Members, and also from Sir Edmund Compton, Comptroller and Auditor General. He noted that it "appeared to involve a return on the capital employed of 17% in the first year, increasing to 45% in the fifth".

In response to yet another question, Sir David Eccles stated that he was advised that there was no alternative source either in this country or abroad for the supplies needed.

**Commons Discuss Objections to Esso Pipeline Bill**

The Esso Petroleum Co. Bill which seeks powers to lay oil pipelines from Fawley to Milford Haven and to London Airport was the subject of objections when a motion for the second reading was put formerly to the House last week. The motion will be put forward again at a later date, and if objectors persist, the subject may come to debate.

Conservative objectors want to delay the second reading until the Government has inquired fully into problems arising from pipe-laying, while two Labour Members want provisions for protection of articles or works of interest found during pipe-laying operations.

The Bill, they say, should ensure that all coins, relics, articles of value and antiquities, etc., "shall be deemed to be

the absolute property of the Minister of Works." Esso, they claim, should also be obliged to carry out at their own expense the Minister's orders as to disposal of such discoveries, and take precautions to prevent workmen from damaging them.

**Government Would Welcome Views on Decimal System**

Conversion of coinage to the decimal system is a problem of great national importance, and the Government would welcome most strongly an expression of public opinion on the matter, stated Mr. Amory in reply to a recent question in the House (see CHEMICAL AGE, 14 May, p. 806).

**Industry's Work for U.K.A.E.A. Worth £9 Million**

Expenditure on civil research and development work placed by the A.E.A. with private industry totalled "about £9 million between 1 August 1954, and 31 March 1960" stated Sir David Eccles in a written answer to a question in the House last week. "The greater part of this sum has been spent in the latter part of the period." He added that, "it would not be in the public interest to reveal the total expenditure on research and development by the Authority".

**Science Library to be Ready by 1965**

The National Reference Library of Science and Invention will be housed in the new Patent Office to be built on the South Bank, London. It is hoped to start building in 1963 and completion is scheduled for the end of 1965. Scientific publications now in the British Museum library will be transferred. This was stated by Lord Hailsham, Minister for Science, in the Lords on Tuesday.

**S.C.I. Overseas Section to Meet in Brussels**

NEXT Overseas Section meeting of the Society of Chemical Industry looks like being as successful as the meeting last year at Frankfurt. To be held in Brussels from 15 to 17 June, it will start with a reception of the Burgomaster of Brussels in the Town Hall on 15 June. The annual banquet is to be held in the Salle d'Honneur, Musees Royaux d'Art et d'Histoire, Avenue des Nerviens, and after the dinner, Count de Borchgrave d'Altena, principal trustee of the Museums, will tour the collections with members. A reception by M. Ernest Solvay will be held at Chateau de La Hulpe on 17 June.

Papers will be given by Professor R. J. Cockell on 'Radiation, a new possibility for the chemical industry', and by Sir Eric Rideal, F.R.S., on 'The role of chemical research in the university and on industry'.

Works visits have been arranged to European Research Associates Laboratories, the Jemeppe factory of Solvay and Co., the Neder-over-Heembeek laboratories of Solvay and to S.A. Photo-Produit Gevaert at Morsel-Antwerp.

## SUCCESS WITH FIRST MEXICAN UNIT LEADS TO SECOND PHTHALIC CONTRACT FOR F.W.

DESIGN and operation features of the first Mexican phthalic anhydride plant, with a normal capacity of 1,700,000 lb./year, are described in *Heat Engineering*, March-April edition, published by Foster Wheeler. Operated by Sintesis Organicas, S.A., and designed by Foster Wheeler, using catalyst and know-how supplied by John M. Weiss and Co., the plant has operated "successfully and steadily" since its start-up early in 1958. Recently a second phthalic anhydride plant has been ordered from Foster Wheeler.

Decision to produce high quality phthalic stemmed from availability of imports and Sintesis Organicas' own plans to produce mild and colourless phthalate plasticisers. Another consideration that had a direct bearing on plant design was the fact that the plant site is 7,500 ft. above sea level. This called for considerably larger compressors and compressor motors than for a plant of the same capacity at sea level. A further consideration was the need to permit substantially continuous operation at rated capacity without burdening the capital cost of the plant with standby equipment. Planned expansion by the addition of a new oxidation line will enable the company to provide an even greater supply of phthalic of the highest quality.

### Safety Considerations

Plant design was also affected by safety considerations including: specification of rugged process controls capable of steady-state reproducibility; interlocks for safe shutdown in the event of a hazardous condition; avoidance of uncontrolled explosive atmospheres; and the specification that at no time should a dangerous quantity of liquid naphthalene come in contact with an air stream (a requirement that eliminated vaporisers which bubble air through pools of liquid naphthalene).

**Oxidation Section.** Filtered air is compressed and heated so that pressure and temperature are fixed by the plant instrumentation. The air is joined by a controlled stream of liquid naphthalene pumped into the plant from a day tank, which, in addition to main naphthalene storage, also permits accurate hourly checks of plant instrumentation and avoids the need for a large quantity of naphthalene in the vicinity of the process area.

Liquid naphthalene and air are introduced under controlled conditions to a patented vaporiser in which sensible heat in the air provides the latent heat of vaporisation necessary. Non-volatiles such as tar are removed from the gas stream, thereby protecting the converter with its contained catalyst. This type of vaporiser has proved reliable even when handling low-grade feed stocks.

The main process stream leaves the vaporiser continuously as a vapour mixture of naphthalene and air. It enters the converter above the catalyst and leaves from the base.

The reaction temperature inside the converter tubes is controlled precisely by regulating the pressure under which mercury is allowed to boil around the tubes. This device ensures that all the tubes receive identical cooling, a uniformity that adds to the operator's ability to run the plant at maximum efficiency. For larger plants, where the cost of mercury becomes excessive, a molten salt circulating system is usually substituted.

In spite of handling 74°C naphthalene during most of the two years of operation, the original catalyst charges are still in use. This, coupled with the high allowable space velocity, makes catalyst cost a very small item.

Heat is removed from the converter by air-cooled extended-surface mercury condensers, which are reliable and require no maintenance. If steam were available at premium cost only, heat recovery reboilers could be substituted for the air-cooled condensers.

Vapour leaving the converters contains crude phthalic anhydride. Only rare

traces of naphthalene can be detected; principal impurities comprise small quantities of naphthoquinone, maleic anhydride and tars. Vapour coolers should not need cleaning under three-monthly intervals.

From the coolers, air and crude phthalic discharge to the crude condensers slightly above the crystallising point of pure phthalic anhydride. Tars, which condense out in the vapour coolers, are removed periodically from steam-jacketed sumps built integrally with the coolers.

**Condensers.** The crude phthalic anhydride condensers in the plant are classical units, built in the form of large air-cooled boxes. If labour costs become a significant factor, alternate designs should be considered for the condensers and, in fact, Sintesis Organicas are doing this in connection with their new plant expansion programme.

**Distillation.** The distillation section is extremely simple. Due to the relatively small capacity, no separate pitch still was provided. Pitch from the still is discharged to a pitch bay after the second or third distillation. Stainless steel, type 316, is said to provide excellent resistance against corrosion or degradation of colour in this section.

From the pure phthalic condenser, the product flows directly through a seal tank to a continuous flaker, which has a chrome-plated drum. Like the vapour cooler in the oxidation section, the pure phthalic anhydride condenser produces low-pressure steam up to 4 atm. absolute pressure. The distillation section contains a Dowtherm vaporiser.

## Crown Zellerbach Build First U.S. Dimethyl Sulphoxide Plant

NOW under construction by Fluor Corporation are plants with capacities for 5 million lb./year dimethyl sulphoxide, a 10 million lb./year dimethyl sulphide and a 1 million lb./year by-product methyl mercaptan, for Crown Zellerbach at Bogalusa, La., U.S. Completion is scheduled for early September. This project represents a stage in the development of Crown Zellerbach as chemical producers and it is the company's first commercial venture in upgrading spent black liquor from its kraft pulping process.

The dimethyl sulphide process is based on a Swedish development for which Crown Zellerbach have exclusive U.S. and Canadian rights from the Swedish Cellulose Central Laboratory. According to *Chem. & Engng. News*, 1960, 38, No. 21, 24, DMS is basically produced by removing methyl groups from the lignin molecule. Sulphur is added to black liquor from the kraft mill and heated to 250°C. The original DMS and methyl mercaptan are formed from the methyl groups in the lignin in a ratio of about 10-to-one. The products are flashed from the black liquor, recovered by condensation and purified. Yield is about 80 lb. of DMS and 8 lb. of methyl mercaptan per ton of pulp.

DMS is converted to dimethyl sulphoxide (DMSO) by liquid phase oxidation using a nitrogen oxide catalyst. This is also a Swedish process licensed from Nitroglycerin Aktiebolaget.

Disparity between the 10 million lb. DMS plant and the 5 million lb. DMSO plant represents a calculated risk by the company, which believes that demand for DMSO and other derivatives of dimethyl sulphide will increase before long. Crown Zellerbach research laboratories are already said to be looking at monochlorodimethyl sulphide, dimethyl sulphone and others. Only other U.S. producers of DMS are Hercules Powder who make it for use as an ingredient in a gas odorant. Crown Zellerbach will be the sole producers of DMSO which is expected to find a variety of applications as a solvent. It is said to be directly competitive with dimethylformamide, but to have very low toxicity and to be an inherently cheaper chemical.

Major outlets for DMSO are seen in synthetic fibre manufacture. It is also a good solvent for some agricultural chemicals, as an ingredient in paint stripping formulations, in petroleum refining, for unsaturated hydrocarbons and aromatics, and for absorption of acetylene from gas mixtures.

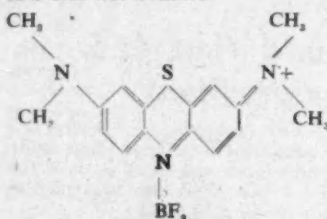


## Analytical Review

## LIQUID-LIQUID EXTRACTION PROCEDURES DISCUSSED

THE determination of boron in materials such as steel and other ferrous alloys presents many problems. Frequently a separation procedure involving ion-exchange, distillation, electrodeposition, etc., is necessary in order to apply the usual colorimetric reagents. Recently a method has been described which circumvents these tedious separation techniques. Furthermore the procedure is sensitive and minimises the factors which are normally so troublesome in all boron analyses—viz. contamination from boron in glassware and reagents and, of course, loss of boron during the careful manipulations which are normally used.

This latest procedure described by Pasztor, Bode and Fernando<sup>1</sup> has the backing of practical experience in a steelworks laboratory behind it and yet bears the stamp of original research. Boron as the  $\text{BF}_4^-$  complex, forms a quite firmly bound complex with methylene blue which can readily be extracted into solvents such as 1:2-dichloroethane and 1:2-dichloropropane. The complex was examined by the mole-ratio method and by Job's method and in each case an empirical formula of 1:1 boron:methylene blue was obtained.



The complex shows strong absorption bands in the neighbourhood of 300 m $\mu$  and 620 m $\mu$  and since the separation between spectra of reagent and complex is greatest at the latter, this wavelength was selected for spectrophotometric measurements. In the pH range 2–4 the extraction is virtually independent of hydrogen ion concentration and is complete in one pass. The nature of the acid has some effect; thus, though mixtures of sulphuric and phosphoric acid have little influence up to pH 1, nitric, hydrochloric and perchloric acids are unsuitable and so also is hydrofluoric acid in high concentration. Fortunately, most steels dissolve readily in  $\text{H}_2\text{SO}_4/\text{H}_3\text{PO}_4$ . The influence of free HF is, however, critical and study of this problem showed that the amount of this acid added to obtain the  $\text{BF}_4^-$  complex must be such that its final concentration does not exceed  $3 \times 10^{-3}\text{M}$ .

Attempts to complex excess of fluoride ion with aluminium ion caused inconsistent results. Apart from its effect on the extractability of the methylene blue complex, however, hydrofluoric acid con-

centration also has a profound effect on the speed of formation of the complex. Thus by increase of concentration of free hydrofluoric acid the present authors were able to lower the extraction time from Ducret's original specification<sup>2</sup> of 18 hours down to two. Further decrease

## By T. S. West, Ph.D.

This article reviews some recent developments in the rapidly expanding technique of solvent extraction procedures in analytical chemistry.

- (1) The determination of boron in steels by extraction of the boron tri-fluoride complex of methylene blue.
- (2) The solvent extraction behaviour of the platinum metals in thiocyanate and pyridine-thiocyanate media.

could not be achieved, however, because of the effect of larger concentrations in increasing the extinction values of the blank analyses.

Methylene blue is of course easily oxidised to a purple compound or reduced to a colourless form, and the latter eventuality occurs when steel samples are dissolved and treated with HF and methylene blue. In the recommended procedure therefore the steel is dissolved, treated with permanganate and then with a very slight excess of ferrous ammonium sulphate. The colour system obeys Beer's law over the range 0.1–6  $\mu\text{g}$  of boron per 50 ml. of sample solution if the methylene blue is present in a four-fold excess. Sensitivity is high, thus  $2 \times 10^{-4}$ – $2.5 \times 10^{-3}\%$  of boron can easily be determined on a 100 mg. steel sample. The extinction of the extract remains constant for at least six hours.

The simplicity of this method is very attractive and from data quoted in the paper it would appear that the sensitivity is much greater than that obtainable by other spectrophotometric reagents—chromotropic acid, quinalizarin, curcumin, carminic acid—used in steel analysis. No comparison appears to have been made against the dianthrime procedure, a study of which was reported in last month's review<sup>3</sup>. The manipulative operations for this procedure appear to be very simple and pleasant and because of the colour stability of the extracted species there appears to be no reason why it should not succeed admirably as a routine procedure.

**Separation of Platinum Metals.** The separation of the platinum metals by extraction of their thiocyanate or pyridino-

thiocyanate complexes has recently been investigated in the analytical research school at Queen's University, Belfast<sup>4,5</sup>. Palladium is extracted as  $\text{Pd Py}_2\text{CNS}_2$  with hexone at pH 11–12 as a yellow complex, and determined spectrophotometrically in the organic phase. At this alkalinity, ruthenium does not form a thiocyanate complex or, if it does, is not extracted. In  $10^{-1}\text{N}$  acid ruthenium (III) does form a crimson extractable compound which is thermally unstable and breaks down to form an intense blue-coloured complex with evolution of hydrogen sulphide.

In this complex, the ruthenium appears to be divalent and the complex is either anionic  $\text{Ru}(\text{SCN})_2^{2-}$  or  $\text{Ru}(\text{SCN})_3^-$ . The complex is formed rapidly and extracts well in 2N acid; its absorption at 750 m $\mu$  shows no diminution over a period of one week. This extraction is carried out best in solution of high thiocyanate concentration. In dilute thiocyanate solution the complex is not completely taken up by anion exchangers and the authors point out the possibility of the existence of a range of thiocyanate complexes from  $\text{Ru}(\text{SCN})^+$ ,  $\text{Ru}(\text{CNS})_2$ , etc.

In a medium containing excess of pyridine and thiocyanate at pH 6–6.5 palladium is separated similarly from platinum (IV) and rhodium. If, however, the solution is then heated, after adjusting to pH 2–2.5,  $\text{H}_2\text{S}$  is again evolved and the golden yellow platinum (II) anionic thiocyanate complex is extracted readily by hexone probably as  $\text{Pt}(\text{SCN})_4^{2-}$ . Rhodium behaves similarly, but is extracted by hexone only in solutions of pH 1.5. Thus it remains behind in the aqueous layer while the platinum is removed and is itself extracted after adding more thiocyanate and making the acidity up to 3N. In this instance, however, it is thought that no reduction of Rh (III) occurs. Platinum and rhodium are also measured spectrophotometrically in the hexone phase at 385 and 380 m $\mu$  respectively.

A complete separation and determination of Pd, Pt and Rh, present in amounts not less than 25, 50 and 50  $\mu\text{g}$  respectively per 20 ml. of solution, can readily be effected in 1½ hours.

Though the authors do not include ruthenium in their composite separation scheme, it appears that it might extract slightly along with the platinum, but mostly with the rhodium.

## REFERENCES

1. L. Pasztor, J. D. Bode and Q. Fernando, *Anal. Chem.*, 1960, 32, 277.
2. L. Ducret, *Anal. Chim. Acta*, 1957, 17, 213.
3. *Chem. Age*, 1960, 83, 685.
4. J. H. W. Forsythe, R. J. Magee and C. L. Wilson, *Talanta*, 1960, 3, 324.
5. *Idem*, *Ibid.*, 330.

## International Congress of Histo- and Cytochemistry

The first international congress of histochemistry and cytochemistry will be held in Paris from 28 August to 3 September 1960. It is organised under the auspices of the *Société Française d'Histochemie* in collaboration with existing world histochemistry, especially the American, German, Belgian, Italian and Japanese societies.



## JET-MOGENISER INTRODUCED BY BOULTONS

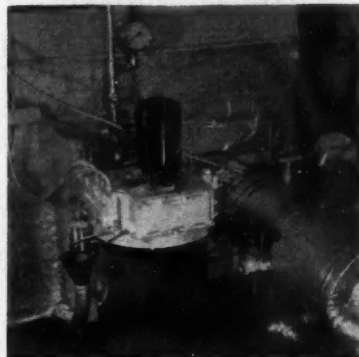
THE American designed Jet-mogeniser has been introduced in this country by William Boulton Ltd., of Burslem, Stoke-on-Trent. It is a three-stage homogeniser utilising the forces of impact, attrition, turbulence and ultrasonic cavitation for dispersion, stabilisation, emulsification and blending processes. The spline pattern has been deliberately thrown out of register to give an eddy of pressure impulses to impede easy access of the processed material.

Four sizes have a production range from 100 to 500 g.p.h. and a special hopper is available for wet-dry feeding, allowing for automatic continuous dry feed combined with metered wet feed.

An illustrated descriptive leaflet is available from William Boulton Ltd.

## IN-LINE VISCOSITY CONTROLLER

THE Smiths viscosity controller, pictured 'in line', developed to satisfy a requirement of the petroleum industry, provides continuous control of the blending process with such precision that it is now possible for any oil company using the instrument to guarantee its



Viscosity controller in use by Mobil Oil

products' viscosities to within 1%. Use of the viscosity controller is also stated to save 3-4% per ton on the cost of making an oil blend.

Its principle of operation is that, by the use of two viscometers, the viscosity of a sample from a pump line is continuously balanced against the viscosity of a sample prepared in the laboratory. The viscosity of each sample is measured by a rotating cup viscometer, the output torque of which acts upon a balance arm.

Manufacturers are Smiths Industrial Instrument Division, Chronas Works, North Circular Road, London, N.W.2.

## NEW METERING PUMP

THE new Metrivar type K is a small capacity variable output pump driven by a totally enclosed vertical spindle 50 cycle motor. A reduction gear is incor-

# EQUIPMENT NEWS

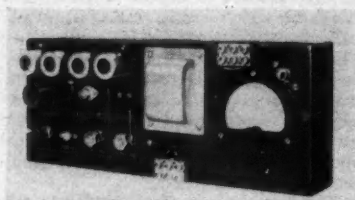
## Chemical Plant: Laboratory Apparatus: Handling and Control Equipment

porated in the gear box and any of three pump speeds can be specified. Capacities (on 50 cycles) range from 0.35 gall./hr. to 3.6 gall./hr. at maximum working pressures ranging from 50 p.s.i. to 500 p.s.i. Length of stroke can be varied from zero to maximum ( $\frac{1}{4}$  in.) while the pump is working or at rest. Manufacturers are Metering Pumps Ltd., 21 The Mall, Ealing, London W.5.

Pump heads are available in ebonite and glass, polythene and glass and in stainless steel. The pump ram is guided and supported in the gear box fixing and does not depend upon any part of the pump head for its alignment. It is, therefore, possible to use such materials as 18/8 stainless steel for the ram and all parts of the pump head. Ebonite headed pumps are fitted with mushroom shaped synthetic rubber valves. Polythene heads have glass ball valves; pumps with stainless steel heads are fitted with flat valves with close tolerance valve lift.

All the pump heads have non-adjustable 'U' rings generally of synthetic or natural rubber except the polythene head which has a polythene non-adjustable gland. Connectors suitable for 3/16 in. bore polythene tubing are fitted to ebonite and polythene pump heads. Stainless steel heads are fitted with connectors which accept any metal tubing of outside diameter. Hose connectors can be fitted as an alternative. Photographs and details of specific applications available on request.

## CONTINUOUS LEVEL INDICATOR



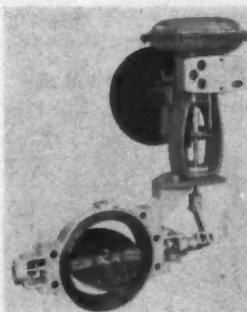
After nine months' field testing, Thomas Industrial Automation Ltd., Altrincham, Cheshire, have now put the new Levolog continuous level indicator into full production. The electrode system can be rigid for small vessels or of the flexible variety for depths in excess of 6 ft.

## BUTTERFLY CONTROL VALVES

Crosby Valve and Engineering Co. Ltd. have now added to their manufacturing programme at Crosby Works, Wembley, the range of Mason Neilan butterfly type control valves. These are available in steel or cast iron as standard materials, as wafer type for mounting directly be-

tween pipe flanges, in sizes from 2 in. to 24 in. as standard.

Valves are normally supplied with air operated diaphragm type actuators for use with all types of pneumatic controls but can also be supplied for lever, hand-wheel, chainwheel or electric motor



Butterfly control valve

operation. Two basic types are available: light or heavy duty, according to the pressure drop across the valve and other service conditions.

Among other features, the valves can readily be changed on site from air to open, or air to close and from 60° to 90° opening. The linkage is arranged so that the maximum possible mechanical advantage is achieved when the torque developed on the shaft by the flowing medium is at its greatest.

On the heavy duty type valves the stuffing box is readily accessible and studs and bolts are exceptionally heavy. Totally enclosed outboard, flexible type roller bearings are used on all sizes.

The illustration shows a valve fitted with a diaphragm type actuator plus handwheel and valve positioner.

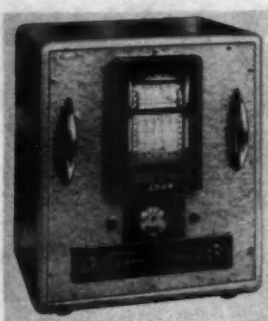
## SHAW MOISTURE METERS

ANNOUNCED by Shaw Moisture Meters, Rawson Road, Westgate, Bradford, is a new

recording hygrometer alarm which uses a unique sensing element. It records continuously the humidity of any atmosphere, hot or cold, dry or damp, under pressure or vacuum, and gives immediate warning of any alteration in dewpoint or humidity.

The most remarkable feature of Shaw hygrometers is said to be the range of 10 million to one, while the sensitivity is "100 times that of any other method. Dewpoints down to -150°C can be measured for the first time with this cheap and simple method".

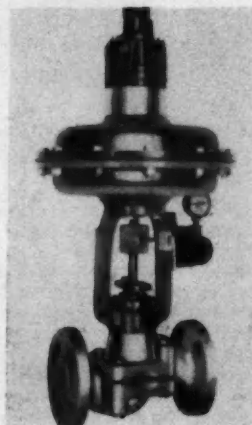
The instrument will work well in dusty conditions without attention. "Measurements previously impossible have been made by prototype instruments working on important research projects by this



Shaw moisture meter

significant advance in dewpoint and humidity measurement."

#### SPLIT BODY VALVE



The Uniflow split-body air-operated valve type 1000 with integral positioner has been designed to withstand arduous service with corrosive media. The valves are available in sizes from 1 in. to 6 in. and are arranged for operation in a pressure range up to 600 p.s.i. Packings are Teflon chevron type, retained by a bolted gland packing and are suitable for operating temperatures of 450°C. Standard packings are available in conditions not suited to Teflon. Suppliers are British Arca Regulators Ltd., Gloucester.

#### ANTI-SIPHON WASTE TRAP IN HOSTALEN

THE new Grevak monitor patent anti-siphon trap in Hostalen (polythene) is a recent addition to the extensive range of Grevak traps by Greenwood and Hughes Ltd., Carlisle House, 8 Southampton Row, London W.C.1, for which hygienic design and efficiency in maintaining a permanent safeguard against unsealing are claimed. The trap has undergone rigorous tests by independent inspecting and testing engineers. It incorporates maximum bore throughout and allows full cleansing discharge through the trap and waste pipe.

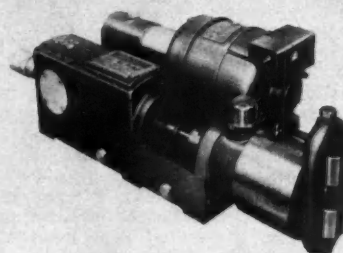
It gives a high efficiency resistance to both induced and self-siphonage providing complete safeguard against unsealing under both average and severe siphonic

action, and is unaffected by boiling water, resistant to detergents and acids, and is automatically resealing.

#### HIGH-PRESSURE METERING PUMP

With the ever increasing demand by industry for accurate metering pumps of very small capacity but of a high degree of metering accuracy and without glands on the pumping side, the Distillers Co. Ltd., Great Burgh, Epsom, Surrey, have recently developed a diaphragm pump with the characteristics which meet these requirements.

The fundamental mechanism of the



D.C.L. diaphragm pump

D.C.L. 'M' pump has been built into a high-pressure diaphragm head unit and the calibration curve "indicates the extraordinary high accuracy which is obtainable with a pump tested at 2,500 p.s.i. with the small maximum capacity of 700 ml/hr."

Prices in this new range of diaphragm metering pumps depend to some extent on materials of construction and pressure-capacity requirements. A unit with stainless steel head, as illustrated, is about £160.

#### CERAMIC-LINED CENTRIFUGAL PUMPS

NEWLY developed Craig ceramic-lined centrifugal chemicals pumps are designed to take advantage of the extreme acid resistance of ceramic materials while embodying modern design conceptions. The aim has been to employ the ceramic as a lining rather than as a load-bearing material and this has resulted in a construction which virtually eliminates the possibility of damage from mechanical shock and gives great rigidity with excellent impeller alignment.

The ceramic linings are bonded to cast iron casings. The open-type impellers, which can pass solids in suspension, are produced in tough shock-resisting ceramic or in acid-resisting metal alloys. Solid titanium impellers are also available. A range of stuffing box and mechanical

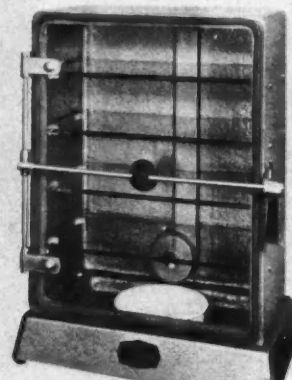
seal arrangements can be fitted. Makers of these pumps are Craig Pumps Ltd., Burnfield Road, Giffnock, Glasgow.

Interchangeability of spares is guaranteed and hydraulic performance can be accurately duplicated. Range covers duties to 120 ft. head; capacities to 400 g.p.m. and temperatures to 100°C can be accommodated.

#### DESICCATOR HUMIDITY CUPBOARDS

THE desiccator and constant humidity cabinets from Townson and Mercer Ltd., Croydon, Surrey, have been redesigned and only one size is now made. It has a chemically-resistant Fibreglass body, while all interior metals fittings are coated with plastics paint against corrosion.

The unframed plate-glass door is still used, but this has redesigned cam-action closure. Four removable glass shelves are provided. A circulating fan, fitted if required, draws air from a tray of desic-

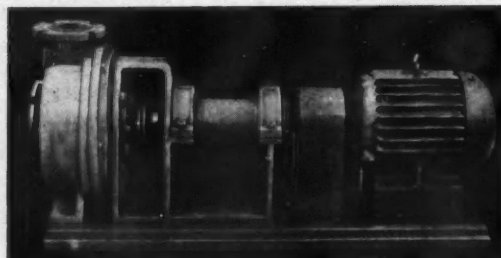


Redesigned humidity cabinet

cant or humidifying agent and passes it via a small duct to the top of the cabinet, ensuring uniform conditions throughout the container.

#### LOW FLOW INDICATOR MODIFICATIONS

A NEW addition has been made to the range of flow indicators produced by Liquid Systems Ltd, Redhill, Surrey. Known as the Model 180, it was primarily designed to give a positive indication of flow only when the flow-rate exceeded one-sixth of a pint per minute. It can, however, be modified to indicate other rates of flow and on receipt of the necessary information the indicator can be supplied set accordingly.



Craig ceramic-lined centrifugal pump



## Overseas News

### S. AMERICA, AUSTRALIA AND AFRICA SHOW INTEREST IN MONTECATINI POLYPROPYLENE

**I**STALLATIONS for the production of polypropylene under Natta-Montecatini licences are either in operation, under construction or in the planning stage in Britain, France, West Germany and Austria. Two contracts have been concluded in Japan and are awaiting the approval of the authorities. What Dr. Carlo Faina, chairman and managing director of Montecatini, describes as "keen interest" is also being shown in South America, Australia and Africa, in plans to set up polypropylene plants.

Patent problems in the U.S. are still preventing Montecatini from obtaining the patents applied for six years ago. Montecatini however have confidence in the legislative principle which aims at attributing an invention to its true inventor.

Montecatini's own production of Moplen polypropylene, with completion of the Ferrara plant and erection of the Brindisi units, will shortly reach 30,000 tons a year—a figure which the company expects to exceed "very soon".

Production of Fertene at Ferrara will soon reach 24,000 tons/year and will in time be supplemented by 30,000 tons/year from plant now being built at Brindisi. Improvements have been made in the plants for Rotene and plants for Crilat acrylic monomers and polymers and methacrylate monomers have started production. These will shortly be followed by plant for Vedril methacrylate polymers. Production of Stiroplasto Vipla and vinyl acetate and polyamide resins, melamine resins ion exchange resins, phenol and urea resins, was developed steadily.

#### Norway to Use Zimmerman Lignine Process

The Zimmerman lignine process, developed and used on a pilot plant scale in the U.S., is to be utilised for the first time on a technical scale this year. The A/S Borregaard chemical concern, of Sarpsborg, Norway, are to bring it into operation for the processing into fuel of the lignine occurring as residue in waste sulphite liquor plus sugar. The Zimmerman process—based on wet oxidation—will save the company at least 50,000 tonnes of imported fuel annually. Borregaard hold the complete exploitation rights for the European pulp and paper industry.

#### New Phenol Plant For the Argentine

A new phenol plant is planned for Argentina as the result of a loan which has been approved by the Export-Import Bank of Washington, D.C. The loan will

be used entirely for purchase in the U.S. of various chemical equipment required by Duranor, Industrial Químicas Sociedad Anónima Industrial y Comercial for this plant which will have a capacity of 25 tonnes of phenol a day.

#### Goodyear to Produce Polydiene Rubbers

Construction is to begin immediately on a multimillion dollar plant for the production of polyisoprene and polybutadiene at Beaumont, Tex. Scientific Design, New York, are to build the plant for Goodyear, who will not disclose the plant's capacity, but they say the output will be both captive and non-captive.

#### New Solvay Products Mark Vast Allyl Derivatives Project

Solvay and Co. have just developed in their works at Tavaux, France, the industrial manufacture of three new products, all derivatives of propylene: allyl alcohol, allyl chloride and glycerol epichlorhydrin. Allyl chloride is a colourless liquid, density 0.935, which can be used as a base for preparing numerous allyl derivatives, employed chiefly in pharmacy and in perfumery. It is used in the manufacture of allyl alcohol and synthetic glycerine.

Allyl alcohol is also a colourless liquid, density 0.850, and is strongly reactive. This product finds wide possibilities for use in organic synthesis (either as allyl alcohol, or in the form of its esters), particularly in perfumery and pharmaceuticals. Glycerol epichlorhydrin, a colourless liquid, density 1.180, is an important intermediate for many reactions in organic chemistry. It is used for preparing numerous glycerol and glycidol derivatives, used chiefly as plasticisers or stabilisers and solvents.

Marketing of these three new products is stated to be the first step in "a vast programme for manufacturing allyl derivatives," including in particular a considerable production of synthetic glycerine, this programme being arranged to start in July.

#### Norwegian Chemicals

The important Norwegian chemical producers Norsk Hydro are to spend a total of 500 million crowns (£25 million) in capital investment, with particular stress on plant automation. Since the end of the war the company has invested some 800 million crowns (£40 million). It now produces one-half of the total world output of nitrate of lime, with an annual level of 1 million tonnes of 15.5 N% nitrate of lime, as well as 200,000 tonnes of finished synthetic fertiliser, 100,000 tonnes of 20.5N% ammonium

nitrate limestone, 70,000 tonnes of urea, 20,000 tonnes of concentrated nitric acid and 10,000 tonnes of nitrate of ammonia, also quantities of the rare gases. Recent developments have been the start of 9,500-tonnes-a-year magnesium output and 30,000 tonnes of carbide.

#### Oil Refinery for Sicily

Concessions for the erection and operation of an oil refinery on Sicily have been granted to the S.p.A. Mediterra Raffineria Siciliana Petroli. The concession covers a crude oil throughput of 2,000,000 tonnes annually, although the refinery will have a capacity of 2,600,000 tonnes.

#### Japanese Carbon Black Plant

The Showa Denko K.K. concern, of Japan, is at present building a carbon black plant, intended to come into production in 1962. The plant will turn out furnace carbon black by the Phillips process.

#### Israeli Polypropylene Yarn

Rogovin-Israel Industries are to produce 1,100 tonnes of polypropylene yarn annually as from 1961, it is announced in Haifa.

#### Yugoslav Polystyrene Plant

Yugoslavia's first polystyrene plant was opened last month at Chromos Chemical Works, Zagreb. The plant will have an initial annual output of 420 tonnes. National annual demand is estimated at 2,000 tonnes.

#### New U.S. Acetylene and Vinyl Chloride Plant

The two U.S. companies, Borden Co. and U.S. Rubber, plan to build a plant which will produce initially 80 million lb. of acetylene and 150 million lb. of vinyl chloride a year. The contract has been awarded to Monochem Inc., but the site has not yet been chosen. The raw materials used will be natural gas or low flash point liquid hydrocarbons and the output of the plant, to be completed in 1962, will be sent to nearby individually owned plants for further processing.

#### Reichhold Acquire Another Plasticiser Firm

Reichhold Chemicals have acquired Deecy Products Co., Cambridge, Mass., manufacturers of plasticisers. This is in addition to Alsynite Corp., of America, and Modiglass Fibres, Inc., acquired by Reichhold in the last few months.

#### Alkali Plant for Argentina

Representatives of the Diamond Alkali Company, U.S., and of the Compañía Industrial de Alcalis, Argentina, recently resumed former studies on the site and construction of an alkali plant which will be known as the Compañía Industria de Alcalis.

#### Agreement on Italian Nuclear Fuels

The recent agreement between the Italian Comitato Nazionale per le Ricerche Nucleari and Allis Chalmers



Manufacturing Co. covers also construction and operation in Italy of a plant designed for chemical separation and manufacture of uranium-thorium nuclear fuels. The firm of Bombrini Parodi Delfino will co-operate in this scheme.

### Enhancing Selection Powers of Phosphate of Zirconium

Dr. Giulio Alberti and Dr. Arminio Conte of Rome have carried out interesting experiments on the effects of heating upon selection powers of phosphate of zirconium used as exchangers.

Such effects were studied in particular in the case of caesium. It has been found that by means of moderate heating, the experimenters obtained specimens of phosphate of zirconium that permitted better separations (also with concentrated solutions) than those afforded by ordinary zirconium phosphate.

It is interesting to note that the improved specimens retained their features after subsequent regenerations of the exchanger.

### E.F.T.A. Pharmaceutical Bodies Meet in Rome

A joint conference was held in Rome last month of the international pharmaceutical manufacturers' bodies of the two European trade blocs, Pharmaceutical Industries' Association in the European Free Trade Association and Groupement International de l'Industrie Pharmaceutique des Pays de la Communauté Economique Européenne. The meeting was for an exchange of opinions over various problems between the two associations. The E.F.T.A. body is operated from the offices of the Swiss Chemical Industry Association in Zurich.

### U.S. Phosphoric Acid Plant in Operation

Valley Nitrogen Producers have started production of phosphoric acid and ammonium phosphate at Helm, Calif. Capacity of the new plant is 16,500 tons of wet process phosphoric acid and 75,000 tons of ammonium phosphate and complex fertilisers a year.

### Hydrocarbons and Helium from Oil Gases

Russian scientists are reported to have developed a process for obtaining heavy hydrocarbons and helium gas from mineral oil's attendant gases. These gases "yield a complete range of hydrocarbons, including butane and propane, when cooled steadily down to  $-35^{\circ}\text{C}$  and at a pressure of 40 atm. Helium extraction results from further cooling." Plans for plants to process attendant gases have already been completed, it is stated. The process makes possible a 50% saving on both plant and current used.

### New Australian Company to Produce Fluorine Chemicals

A new, jointly owned company to manufacture chemicals in which they have common interests, especially in the fluorine field, is being formed by Consolidated Zinc Pty. Ltd. and Monsanto

Chemicals Australia Ltd. Initially the new company will produce the Isceon range of fluorocarbons which have for some years been manufactured in the U.K. by Imperial Smelting Corporation, another member of the Consolidated Zinc group. These fluorocarbons, which are not at present manufactured in Australia, are used as refrigerants and pressure pack propellants.

The plant, to be located at Monsanto's site in Sydney, is expected to be in production by mid-1961. Monsanto Chemicals Australia are a subsidiary of Monsanto Chemicals Ltd.

### Heat-resistance Claims for New Goodrich Resin

B. F. Goodrich Chemical, U.S., claim that their new resin, Hi-temp Geon, a polyvinyl dichloride, has a heat resistance at temperatures of  $180^{\circ}$  to  $200^{\circ}\text{F}$ , compared with the  $130^{\circ}\text{F}$  of previous vinyls. Hi-temp Geon can withstand pressures of up to 150 p.s.i. at  $180^{\circ}\text{F}$ , a property which makes it suitable for use in domestic plumbing. Besides its suitability for pipes, Goodrich Chemical hope that the new resin's resistance to strong acids and alkalis will make it suitable for handling hot acid solutions at high temperatures and pressures.

Goodrich Chemical have applied for a patent on the product and for this reason will not specify the composition beyond saying that there are two chlorine atoms in every unit in the chain. The new vinyl is in pilot plant production at Avonmouth, Ohio, and Goodrich Chemical plan to have Hi-temp Geon in limited supply next year.

### Plastics Industry Thriving in Formosa

According to a report from Formosa (Taiwan), the new plastics industry is one of the most prosperous in the island. The

Formosa Plastic Corp., established in 1957 with an initial capital of nearly \$1 million under the first four-year economic development plan, will achieve a monthly output capacity of 1,200 tons this autumn, following the installation of new machinery. Exports, notably of p.v.c. powder, go to Korea, Viet-Nam, the Philippine Islands, Thailand and Hong Kong. Viet-Nam is reported to have invited experts from Formosa to assist in the establishment of a plant for the manufacture in Viet-Nam.

### New Unit in Portugal to Produce Urea

An agreement has been signed between Montecatini and Uniao Fabril do Azoto of Portugal for construction of a 40,000 metric tons/year urea plant at Labreiro, near the town of Barreiro on the Tagus River. The Portuguese plant will be the 34th major industrial unit using the Fauser-Montecatini process for urea manufacture.

The plant is being engineered by the M. W. Kellogg Co. and will incorporate the Fauser-Montecatini process of total recycle in the liquid phase, which allows full utilisation of the ammonia feed in the formation of urea.

### Acetic Acid in India

A new private company, Indian Organic Chemicals Ltd., is planning to open a plant for production of acetic acid at Khopoli, near Bombay. The installation will have an initial monthly capacity of 250 tonnes. The company, in which West German interests have a holding, is to purchase its main plant from the Chematur concern of Sweden at a cost of some Rs2,500,000. This sum will come from credit granted by the Industrial Credit and Investment Corporation of India Ltd.

## French Process for U.S. Fertiliser Plant

WITH the starting up of a new fertiliser plant at Kennewick, Wash., the U.S. company, California Spray-Chemical, further strengthened their position as second largest U.S. producers of nitrogenous fertiliser. Calspray, a subsidiary of Standard Oil, also operate a fertiliser plant at Richmond Calif. The new plant will produce mainly nitric acid, ammonium nitrate, liquid fertiliser and complex plant foods.

The Societe Potasse et Engrais Chimiques process for the production of complex plant foods, licensed by Chemical and Industrial, who built the plant, uses nitric acid, rather than sulphuric, to acidulate phosphate rock, thereby yielding an immediate combination of nitrogen and phosphorus. The reaction is completed by the addition of the correct amount of ammonia and sulphuric or phosphoric acid. This process makes all the phosphorus pentoxide available as plant food. Potassium hydroxide can be added if a complete fertiliser is required. The slurry, under pressure, is

then sprayed into the spherodiser where it is simultaneously pelletised and dried by the C. and I. process. The complex plant unit will produce three types of pellets.

The ammonium nitrate unit can produce either solution (200 tons a day) or dry prill (150 tons a day). The solution is produced directly from the reaction of ammonia with nitric acid. The solution can either be further diluted to obtain nitrogen liquid fertiliser or concentrated to an almost anhydrous solution and prilled by the C. and I. process.

Nitric acid is produced by the oxidation of ammonia under pressure using platinum as a catalyst. The output, 150 tons a day, goes to both the complex fertiliser and the ammonium nitrate units. In the liquid fertiliser unit, aqua ammonia neutralises green phosphoric acid, giving monoammonium and diammonium phosphates, at a rate of 200 tons a day.

## X-Ray Analysis in Corrosion Prevention

X-RAY analysis can provide useful information about the nature of oxidation and corrosion processes in metals; and the technique is sufficiently versatile to enable minute fragments of corrosion substances to be examined *in situ*.

This was observed by Mr. H. P. Rooksby, of the research laboratories of the General Electric Co. Ltd., in a lecture presented before a joint meeting of the North of England Section and the Micro-chemistry Group of the Society for Analytical Chemistry, and the University of Hull Chemical Society, held recently at the University in the Department of Chemistry.

Previously, a paper 'High-temperature oxidation of metals' was read by Dr. S. J. Gregg of the Department of Chemistry, Exeter University.

At the meeting the chair was taken by Mr. F. Holmes, chairman of the Micro-chemistry Group.

## Marchon Produce Alkyl Phenol Ethoxylates

LARGE-SCALE production of alkyl phenol ethoxylates has now been started by Marchon Products Ltd. These non-ionic surfactants will cover two main series, the octyl phenol ethoxylates and the nonyl phenol ethoxylates and will be marketed under the trade mark of Empilan.

The versatile range of alkyl phenol ethoxylates adds to the ever-growing number of surfactants produced by Marchon. In addition, a range of sulphated alkyl phenol ethoxylates is being developed. The function will be available shortly.

## Stainless Steel Tank Explodes: £2,000 Damage

A chemical explosion in an experimental department at Ward Blenkinsop's, Halebank, Widnes, which occurred on 24 May, blew off hundreds of square yards of roof, wrecked valuable equipment and started a fire. The day shift workers had just clocked off and no injuries were reported. Without accounting for the experimental equipment, the damage to the building is estimated at about £2,000. A statement from the management said: "The large tank in which the chemical exploded is made of stainless steel. It is used for many experiments which take place here in the manufacture of fine chemicals."

## Simon-Carves and Giammarco-Vetrocoke Process

In our issues of 14 May, p. 806 and 21 May, p. 842, we referred to the fact that the Coppee Co. had been appointed licensees for the Giammarco-Vetrocoke process. Simon-Carves Ltd. have since asked us to point out that they are also licensees of this process and that they have had technicians at the Vetrocoke works in France, where they have studied the process.

# A.B.C.M. CONTAINER MARKING SCHEME FOR CHEMICALS

**M**ARKING of containers scheme, operated by the Association of British Chemical Manufacturers, was described by Mr. W. M. Diggle, secretary of the A.B.C.M. marking containers committee, at the national industrial safety conference held by the Industrial Safety Division, Royal Society for the Prevention of Accidents, at Scarborough on 27 to 29 May.

Mr. Diggle's paper, entitled 'With care, a chemical approach,' reviewed the history of the scheme. Its success was evidenced by the fact that practically every member-firm making hazardous chemicals voluntarily applied it to their products. Operating the scheme was simple and it was done through a committee representing member-firms, each of whom was an expert in a particular field. Manufacturers needing a label for a particular product, submitted their request to the committee; or the committee might feel that a particular product should be labelled. In either case all manufacturers of the product were contacted. By discussion, agreement was reached on the standard phrases to be used, the wording ratified by the committee and published in the manual.

The work of the committee went beyond that. Members, by contacts in their own firms and others, had a close knowledge of the needs of the chemical in-

dustry in the field of labelling. Those contacts extended beyond the U.K. industry to an interchange of experience with the U.S. Manufacturing Chemists' Association and similar organisations on the Continent, as well as to the International Labour Office, Geneva.

Mr. I. K. B. Legge, H.M. chemical inspector of factories, who spoke on 'Industrial safety and the use of ionising radiations,' said that ionising radiations had proved a valuable industrial tool and were even utilised in some safety devices. In common with many processes, an element of risk was associated with their use.

Radioisotopes could be divided into sealed and unsealed sources. From the safety point of view, the main difference was that sealed sources should provide only an external radiation hazard whereas unsealed sources, which might enter the body by inhalation, ingestion or skin absorption, provided both an external and internal radiation hazard.

Protection against external radiations could be provided by shielding, distance and time. To protect against internal radiation precautions must be taken to prevent the radioactive substance, which might be powder, liquid or gas, from entering the body, and the techniques adopted were in principle similar to those used for other industrial toxic materials.

## Continued Expansion in Commonwealth Production of Fertilisers

**P**RODUCTION and consumption of commercial fertilisers in the Commonwealth have continued to expand in recent years, and the capacity for further growth in output is being created as more large fertiliser plants are constructed in Commonwealth countries. This is shown in a study by the Commonwealth Economic Committee entitled 'Fertilisers in the Commonwealth, 1950-58' (price 4s 3d by post, from H.M. Stationery Office), which summarises the main developments in production, consumption and trade since the committee's previous report covering the early post-war years. The memorandum deals with the three main plant nutrients.

Setting the Commonwealth in the world picture, the study draws attention to the striking rise in production and consumption in Continental Europe and Japan, following the low levels ruling immediately after the war. Statistics of world trade in fertilisers show that exports come mainly from Continental Europe, while Canada is the Commonwealth country with the largest export trade. Most countries rely on supplies of potash from France, Germany and Spain but enormous deposits in Canada have been investigated, and although production was started only in 1958 exports began in 1959.

The memorandum reviews technical developments and shows for each country of the Commonwealth details of production, consumption and trade. Details are given of the new plants recently completed or under construction.

## Rare-Earth Metal Borides

An unclassified publication dealing comprehensively with the structures and properties of the rare-earth metal borides has been issued by the U.K. Atomic Energy Authority (AERE-Trans 849), and can be obtained from Library, Atomic Energy Research Establishment, Harwell. The borides of scandium, yttrium, lanthanum and the lanthanides have in recent years found application in various branches of modern technology, particularly in electronics.

## Oil Companies Tending to Buy More Chemicals

A distinct tendency on the part of the oil companies of the U.K. to increase expenditure on chemicals is revealed by the value of such chemicals purchased by them in the first quarter of this year, £8.3 million—a figure which is about £2 million higher than that for the same quarter of 1959.



● **Mr. A. Peter Dickson** is promoted to the new position of marketing controller of Bayer Products Ltd., and joins the management committee of that company and of Winthrop Products Ltd. **Dr. K. Boheimer** is appointed medical controller and a member of the management committee of both companies. Other new appointments are **Mr. G. Teeling-Smith**, commercial controller and a member of the management committees. **Mr. F. W. Whiting**, formerly commercial development manager of Bayer Products, promoted to the new post of development controller.

● **Dr. M. A. Phillips, F.R.I.C., M.I.Chem.E.**, has been appointed pest technology consultant to the new journal *Agricultural and Veterinary Chemicals*.

● **Mr. G. N. C. Flint**, chairman, **Mr. F. F. Farage** and **Mr. J. Lee-Ure** have resigned from the board of United Indigo and Chemical Co.

● **Mr. Denis E. Rooke, B.Sc. (Eng.), A.M.I.Mech.E., A.M.I.Chem.E., A.M.I. Gas E.**, has been appointed as development engineer to take charge of the new Development and Planning Section being established by the Gas Council. Mr. Rooke is at present development engineer of the South Eastern Gas Board, a position he has held since January 1959.

● Fellowships for the academic year 1960-61 have been awarded by the CIBA Fellowship Trust to **Dr. V. P. Ayra** (Banaras University, London University, Zurich Polytechnic) to study natural products chemistry in Stockholm; to **Dr. K. Jones** (Sheffield) to study organic chemistry at Heidelberg University; to **Mr. C. N. Banwell** (Cambridge) to study spectroscopy at Zurich; to **Miss P. M. Bryant** (Oxford) to study organic chemistry at Basle; to **Mr. R. Grinter** (Exeter) to study physical organic chemistry at Zurich; and to **Mr. J. R. Miller** (Cambridge) to study inorganic chemistry at Munich.

● **Dr. M. Tordoff**, associate editor of the *Journal of the Textile Institute*, is to edit the *Journal of the Society of Dyers and Colourists*. He is secretary of the Manchester Federation of Scientific Societies.

● **Dr. Wallace Ruddell Aykroyd**, director of the F.A.O. Nutrition Division, has been appointed senior lecturer in the Department of Nutrition at the London School of Hygiene and Tropical Medicine.

● **Mr. R. L. Fenwick** will be joining Technicon Instruments Co. Ltd. as sales manager from 1 June. He comes from Quickfit and Quartz Ltd. where he was field sales manager.

● **Monsieur E. Junod**, of Switzerland, has been elected 1961 president of the Pharmaceutical Industries' Association in the European Free Trade Association which met in Rome last month and of which the U.K. is a prominent member.

● **Dr. A. W. Baldwin**, an associate research manager of the Dyestuffs Division of I.C.I. Ltd., retired at the end of May after 38 years with the company and its predecessors. His name was asso-

## PEOPLE in the news

ciated with many new long chain products, including the Lissapols and Velan.

In 1943 he left the practice of chemistry to become publicity manager for Dyestuffs Division. Although he had a natural aptitude for this type of work, he returned five years after to the administrative side of research work, as associate research manager in charge of researches in the field of colour photography. Since 1958 he has been personal assistant to Dyestuffs Division's research director.

● **Mr. R. F. G. Trewick, B.Sc., A.R.I.C.**, has left the U.K. by air to take up the appointment of managing director of Evans Medical (India) Private Ltd. in succession to **Mr. J. S. Robison** who has returned to this country. Mr. Trewick spent three years in Burma as a manager in the Burma Pharmaceutical Industry and on returning to the U.K. in 1959 was appointed assistant to the works general manager at Speke.

● **Mr. H. W. Magee** has been appointed as special representative, European activities, for the Petrochemicals Department of Gulf Oil Corporation, U.S. His offices will be in Gulf House, 2 Portman Street, London.

● The fourth Robert Horne Memorial Lecture will be delivered by **Professor F. D. Richardson, D.Sc., Ph.D., M.I.M.M.**, professor of extraction metallurgy at the Imperial College of Science and Technology, on 29 September next in Bristol. The title of the lecture is 'The extraction of metals and the chemistry of melts.'

● **Mr. A. D. Wilson**, whose father, **Mr. A. L. Wilson**, is chairman of John and E. Sturge Ltd., Birmingham, has joined the board from 1 June. He will continue to be general manager of the works at Selby, Yorks, which is concerned mainly with the production of citric acid by the industrial mould fermentation process.

● **Mr. A. Carrington**, assistant in research in theoretical chemistry at Cambridge, has been elected to a research fellowship at Downing College from 1 October.

● **Dr. C. C. Addison, B.Sc., Ph.D., D.Sc., F.R.I.C.**, Reader in the Department of Chemistry, Nottingham University, has been elected Professor of Inorganic Chemistry from 1 October.

His current interests include reactions in non-aqueous solvents, especially liquid oxide of nitrogen, molten salts and liquid metals. **Dr. M. W. Partridge, B.Sc., Ph.D., B.Pharm.F.P.S.**, Lord Trent Reader in pharmaceutical chemistry, has been elected to the Lord Trent Chair in the same subject. Among his chief interests at the present time are problems of environmental carcinogenesis, particularly in relation to polyazapoly-cyclic compounds.

● **Mr. D. J. S. Hartt** (May and Baker) has been elected president of the Industrial Pest Control Association. **Mr. G. N. Campbell** (Geigy Co.) has been elected vice-president, **Mr. S. Farrow** (London Fumigator Co.) is hon. treasurer, and **Mr. W. A. Williams, M.B.E.**, is secretary.

### Balfour Group Sees Wider Scope for Stainless Steel

VASTLY bigger markets for stainless steel were foreshadowed last week by the opening of the new Balfour Group chemical engineering development centre at Leven, Fife, by Mr. John MacLay, Secretary of State for Scotland (*CHEMICAL AGE*, 28 May, p. 877). The new centre will cost £50,000 a year to operate.

**Mr. W. L. Burns**, chairman of the Balfour Group, said on the opening day that stainless steel was being used increasingly by chemical engineers because of its resistance to attack by so many chemical materials. The expansion of chemical engineering that would result from the opening of the development centre would create an even bigger demand for stainless steel.

**Mr. W. S. Johnston**, assistant chief draughtsman of the Balfour Group, said that such things as stainless steel pipe flanges, supplied in large quantities to the group by William Oxley and Co. Ltd., Rotherham, found their way, through chemical engineering, into countless other industries, from food processing to atomic power.

### Pfizer's £50,000 for a Kent University

Pfizer Ltd., Sandwich, Kent, will subscribe £50,000 towards the establishment of a Kent University.

### Obituary

**Sir Oswald A. Scott, K.C.M.G., D.S.O.**, chairman of directors of Detel Products Ltd., died on 19 May, aged 67. Although he had held that post only since October, 1959, Sir Oswald had been connected with the company since its inception in 1931.

### Wills

**Mr. Edmond Johnson Boake**, former chairman of A. Boake Roberts and Co. Ltd., who died on 17 March, aged 91 years, left £774,733 net (duty paid £516,340).

**Mr. Wilfrid (or Wilfrid Lawson) Hill**, chairman of the County Chemical Co. Ltd., who in 1906 formed the County Perfumery Co. Ltd., and who in 1939 sold the company to Beecham-Maclean Holdings Ltd. for £600,000, died on 18 December last, aged 91 years, leaving £155,268 net.



## Commercial News

### British Drug Houses

During 1959, British Drug Houses acquired J. R. Gibbs Ltd., who own Ferris and Co., suppliers of laboratory chemicals and apparatus, and Rowland James Ltd., said Mr. Geoffrey C. R. Eley, chairman, in his annual statement. First stage of the laboratory chemicals building on the new Poole site is already in use. This was intended as part of a three-stage expansion programme, but this side of the B.D.H. business has grown so much that the last two stages are being undertaken immediately. Total cost will be about £750,000.

B.D.H. research led to two new preparations, a progestational agent and a diuretic each relying for its action on new chemical substances, and each the only substance in its field discovered in a British laboratory.

Even if all went well with the new substances, which when tried on animals showed outstanding promise as oral contraceptives, results could not expect to be available before mid-1961.

### British Titan Products

Production of British Titan Products Co. Ltd. in 1959 was up 20% and sales were higher by about 22% declared Mr. G. H. Beeby, chairman, who added that sales were limited only by the capacity of the plants. In certain export markets, the company could not supply customers' needs in full. Sales so far this year show a substantial increase and with "near certainty", the good results for 1959 will be surpassed by those for 1960. New overseas plants, with the extended units at Grimsby and Billingham, will give not only a much bigger tonnage, but greater flexibility and a wider range of pigment types.

Group trading profits were £6,077,950 (£4,127,431). After all charges including depreciation of £1,340,219 (£1,245,406), tax of £1,872,148 (£864,914) and compensation of £13,000 to a former director for loss of office, net profit was 81.5% higher at £2,372,271 (£1,312,198). Dividend payment on ordinary takes £980,000 (£809,045).

### Wm. Butler and Co.

Group net profits for 1959 of Wm. Butler and Co. (Bristol) Ltd., before minority interest, were £108,771 (£22,201), and a dividend of 10% was declared (6%).

### Consolidated Zinc

U.K. profits from zinc smelting and sulphuric acid showed a substantial improvement, said Mr. L. B. Robinson, chairman of the Consolidated Zinc Corporation, in his annual report, mainly due to improved performance of the vertical retorts, particularly the Imperial Smelting process plant at Avonmouth. Trade recession persisted into 1959 and despite improvement in demand in the second half of the year, 1959 sales of sulphuric acid were again below the

- B.T.P. Production and Sales Each up 20%
- Laporte Report 80% Net Profit Rise
- Davy-United and Power-Gas Merger
- Proposed Mergers for Simon Engineering

previous year. By end-1959 deliveries were at an appreciably higher rate than at any time in 1958; this improvement has been well maintained.

Sulphuric acid sales by Sulphide Corporation, Australia, were a record. Construction of the new 250 tons/day contact plant to produce acid from sulphur gases is well advanced. Superphosphate sales were up 10%.

Barium chemical sales improved in 1959 despite continental competition. Further expansion is expected and a new series of barium compounds is being introduced for use in oil additives.

The Avonmouth beryllium plant of Consolidated Beryllium, is expected to be operating before the end of 1960. Production and sale of Isecon fluorine-based chemicals rose sharply in 1959 and higher plant capacity is already fully absorbed. Production of hydrofluoric acid was up some 30% on 1958. (See also 'Project News,' p. 909.)

Pure Chemicals of Kirkby extended their sales of fine chemicals and p.v.c. stabilisers. The product range has been widened to include new chemicals for pharmaceutical purposes.

Group capital spending amounted to £3.56 million on the Imperial Smelting process plant and ferrous sulphate treatment plant at Swansea, improvements at Avonmouth, the new sulphuric plant at Cocker Creek, etc. Commitments at the year end totalled £7.1 million, mainly for Imperial Smelting's process plants at Swansea and Cocker Creek and a new Australian head office.

### Laporte Industries

Group trading profit of Laporte Industries Ltd. for the year ended 31 March was £4,334,660, a 51% increase on last year's figure of £2,860,238. After tax of £1,339,847 (£809,640) and depreciation of £1,109,869 (£968,786), net profit rose by 80% to £1,808,096 (£1,003,738). Subsidiaries retain £587,995 (£444,474) and general reserve takes £410,000 (£137,661). A final dividend of 7½% is announced as forecast on capital increased by a one-for-five scrip issue. This makes a total equivalent to 10% (6½% equivalent). Annual meeting will be held at Winchester House, London E.C., on 14 July.

### Davy-Ashmore

Proposals for the merger of Davy-United and the Power-Gas Corporation will be strongly recommended by boards of both companies, who are confident that the merger has a sound economic and commercial basis. Under the proposed terms, Davy-United will offer 17 £1 ordinary shares in exchange for every 20 10s. ordinary shares of Power-Gas. Davy-United are the vehicle for the merger and on the proposals becoming effective their board will be enlarged

and will initially comprise an equal number of directors from each group.

Davy-United will change their name to Davy-Ashmore, thereby continuing the name associated with a principal operating subsidiary of the Power-Gas Group. If the offer is accepted in full, issued share capital of Davy-Ashmore will be £5,399,056, made up of existing ordinary capital £3,019,056 (55.9%) and issued to Power-Gas ordinary holders £2,380,000 (44.1%). The division is based primarily on earning power.

Davy-Ashmore will be a holding company, the existing subsidiaries of the two groups will continue to operate under present managements and the name Power-Gas Corporation will be taken by one of the operating subsidiaries. The formal documents will be ready for despatch in about six weeks.

### Head Wrightson Minerals Firm

The Head Wrightson Colliery Engineering Ltd., Sheffield, a subsidiary of Head Wrightson and Co. Ltd., Thornaby-on-Tees, have changed their name to Head Wrightson Minerals Engineering Ltd. This change takes note of the company's expanding activities in the treatment of minerals other than coal.

Head, Wrightson and Co. Ltd. are raising their total Ordinary dividend to 14% from 13½%, with a final payment of 10%, making 14% on capital as enlarged by a one-for-one scrip issue. Net profit for 1959 amounted to £803,758 (£874,654).

### Manchester Oil Refinery

Chairman of Manchester Oil Refinery (Holdings) Ltd. told the annual meeting in London last week that the first quarter improvement in profits had continued in April. The board expected the year's profits would rise appreciably above those for 1959.

### Henry Simon/Simon-Carves

Full particulars for the proposed merger of Henry Simon (Holdings) Ltd. and Simon-Carves Ltd. have now been sent to shareholders of both companies.

It is proposed that Henry Simon (Holdings) will transfer their existing business (other than their shares in Simon-Carves and its surplus cash) to a wholly-owned subsidiary of the same name and will change their own name to Simon Engineering Ltd. Simon Engineering will have as their other direct wholly-owned subsidiary Simon-Carves.

When the scheme is approved the outside ordinary shareholders of Simon-Carves will hold 52.3% and those of Henry Simon 47.7% of the equity of Simon Engineering.

The consolidated trading profits of Simon Engineering for 1960 are expected to be not less than the aggregate of those

of the two companies for 1959. In such event the directors of Simon Engineering would expect to recommend, on the £3,755,275 Ordinary capital in issue after the merger, dividends for 1960 totalling 26½% less tax. This would be equivalent, so far as the outside shareholders of the two companies are concerned, to 40% on their existing holdings as compared with 35% paid or recommended by each company in respect of 1959.

The board of the new company will initially comprise Mr. R. B. Potter as chairman and nine directors, each of whom is presently a director of either Simon-Carves or Henry Simon: D. T. Barritt, H. Clarke, I. Hay, N. Hinton, E. G. Liebert, C. G. H. Simon, G. H. Sugden, C. H. Wooll and J. P. V. Woollam.

### Air Liquide

The French chemical concern, Air Liquide S.A. pour l'Etude et l'Exploitation des Procédés Georges Claude, announce a gross profit for last year of NF57,180,000 (50,340,000) and a net profit of NF23,390,000 (20,760,000). A dividend of 18½% for old shares and half-dividend for new shares—totalling NF65,000,000 and NF16,250,000 respectively—is to be declared, while the company's 84,210 founders' shares will receive a unit dividend of NF38.60 (36.73).

### Allied Chemical Corp.

Allied Chemical Corporation, New York, are expecting the current year to be a record in their history, with sales of some \$800 million resulting in a profit per share of between \$2.75 and \$3.00. In 1959 the company had a turnover of \$720 million and a net profit of \$50 million or \$2.51 per share. Heavy expansion of foreign activities is to take place, particularly in nylon production. Inland nylon output is to be increased from 23 million lb. annually to 80 million lb./year in 1962.

### Algemene Kunstzijde Unie N.V.

A dividend of 16%, 4% of which has already been paid as an interim dividend, is suggested by the board of Algemene Kunstzijde Unie N.V., Holland. In 1958 the dividend was 12%.

### Canadian Chemical Co.

Profit of the Canadian Chemical Co. in 1959 (\$3,319,000) did not represent an adequate return on total investment, said Mr. R. Ord, president, at the annual meeting. Increased capacity, resulting from equipment or process modifications and higher efficiency, was achieved in all units.

### Chemical Fund

The total at the disposal of the U.S.-based Chemical Fund was as at 31 March \$249.6 million (\$266 million on 31 December). Shares in Goodrich, Gulf Oil and Standard Oil of California dropped in the total, while the Upjohn and Royal Dutch interests rose.

### Dow Chemical

Net sales for the nine months to 29 February of Dow Chemical Co., Mid-

land, Mich., totalled \$576 million (\$511.3 million) and net income was \$61.2 million (\$41.7 million).

### Italian Sandoz

The Milan branch of the Sandoz, Basle, announce a net profit of Lire 121,000,000 (Lire 101,000,000) for 1959.

### Kali-Chemie AG.

The Hanover, West Germany, chemical producers Kali-Chemie AG have declared a dividend of 16% (14%). Capital is to be raised by 50% by the issue of new shares in the ratio 1 to 2.

### Minerals and Chemicals

Minerals and Chemicals Corporation of America, Philipp Brothers Inc., New York and Philipp Brothers Ore Corporation are to be merged into one company to be known as Minerals and Chemicals-Philipp Brothers Inc. Net assets of the companies at 31 December were about \$52 million. Combined consolidated net earnings in 1959 were about \$8.5 million.

### National Starch and Chemical

Net sales of the National Starch and Chemical Corporation, New York, during 1960 amounted to \$13,429,231 (\$12,374,035). Net income after taxes was \$759,003 (\$692,315).

### Saint-Gobain

Saint-Gobain, Paris, announce a turnover for last year of Old Fr92,023 million (79,331 million) and a net profit of Old Fr3,342 million (2,393 million). Dividend is New Fr5.50 (Old Fr6.00).

### Schering AG

The West Berlin chemical concern, Schering AG, is to pay a dividend of 14% (13½%) on its share capital of some £6,850,000 for the 1959 financial year. After depreciation of DM18,400,000 (9,500,000) the company recorded a net profit of DM9,800,000 (9,450,000).

### Schering Corporation

Schering Corporation raised their turnover by 13% in the first quarter on the figure for the corresponding period of 1959, though net profit dropped slightly. A further increase in turnover of from 10 to 15% is expected by the concern for the rest of 1960.

### Union Carbide

At least \$40 million are to be spent on new plant and equipment this year by the foreign subsidiaries of Union Carbide, New York, as compared with a total for the past three years of \$100 million. Apart from the U.K. plant to be opened during the year, works for polythene and other materials will be opened in Italy and India. Spending on plants and equipment, including in the U.S., totalled \$471 million in the last three years and is expected to be at least \$175 million a year in both 1960 and 1961. Sales for the first three months of 1960 \$395.3 million, 9% up on first quarter sales of 1959, and a record.

### INCREASES OF CAPITAL

BRITISH WAX REFINING CO. LTD. 31 St. Johns Road, Redhill, Surrey. Increased by £15,480, in £1 ordinary shares, beyond

the registered reduced capital of £9,520.

WILLIAM W. OSGERBY, LTD. Soap and chemical manufacturers, etc., 84-6 Hodgson Street, Hull. Increased by £20,000, beyond the registered capital of £10,000.

DOW CHEMICAL CO. (U.K.) LTD. 48 Charles Street, W.I. Increased by £200,000, beyond the registered capital of £50,000.

### NEW COMPANIES

ASPRO-NICHOLAS (TRUSTEES) LTD. Cap. £100. To undertake and discharge the office and duties of trustee of any pension and benevolent funds for the benefit of employees and ex-employees or their dependents of Aspro-Nicholas Ltd., etc. Solicitors: A. W. Sampson, Slough. Reg. office: 16 Berkeley Street, London W.1.

LIQUATONE CO. LTD. Cap. £900. To acquire letters patent, brevets d'invention; and to manufacture pharmaceuticals, etc. Directors: A. T. Thomas, I. Thomas and Dr. J. H. Tintner. Reg. office: 39a Alton Road, London S.W.15.

GALLWEY AND WOLMAN LTD. Cap. £100. To import or to manufacture and sell and deal in, in Great Britain, any products or articles designed, invented, produced, manufactured or dealt in by Allgemeine Holzimpragnierung Dr. Wolman GmbH, of Sinzheim, Germany, manufacturers of timber preservatives (known as "Ahig"), etc. Directors: G. Gohert, E. G. Gohert and I. P. Lindsey-Benton (all directors of Gallway Chemical Co. Ltd., etc.); Hilda Wolman, Hans Joachim F. von Kruedener and Louis G. Chambers. Reg. office: P.O. Box 3, Fieldhouse Lane, Marlow, Bucks.

HANTS CHEMICAL CO. LTD. Capital £1,000. To manufacture and deal in chemicals, chemical compounds and minerals, etc. Directors: E. T. L. Schioler, N. Wilkinson. Reg. office: Vincent House, Vincent Lane, Dorking.

POTTER AND CLARKE (DEVELOPMENT PROJECTS) LTD. Cap. £100. To engage in and carry on research into the manufacture, processing and production of all chemical, medical and pharmaceutical preparations, etc. Directors: G. Russell-Hay and L. J. Critchell, R. A. Bennett-Levy and A. J. West. Solicitors: Richards Butler and Co., 11 Waterloo Place, S.W.1.

RICHARDSON AND CO. (MINERALS) LTD. Merchants of and dealers in minerals, chemicals, fertilisers, etc. Directors: E. Richardson, 16 Briardene Crescent, Gosforth, Newcastle upon Tyne 5, and J. Stephens.

STORTSIDE SERVICES LTD. Cap. £100. Chemical engineers, fuel technologists, consultants and advisers, and dealers in chemical plant of all kinds, etc. Sec.: Eleanor C. Venn. Reg. office: 122 Hadham Road, Bishop's Stortford, Herts.

### RECEIVERSHIP

O. M. SEMAN LTD. Chemical manufacturers, etc., 235 Regent Street, W.1. Leonard Irvine, of 118 Old Broad Street, E.C.2, was appointed Receiver and Manager on April 22, 1960, under powers contained in debenture dated February 5, 1960.



## Market Reports

### Whitsun Interrupts Contract Deliveries

**LONDON** Steady trading conditions characterise most sections of the industrial chemicals market and the undertone is firm. A fair amount of additional business has been placed for nearby requirements, but the proximity of the Whitsun holiday has interrupted contract deliveries to some of the consuming industries.

Price changes include reductions for acetone from 30 May, ranging from £6 to £8 a ton, depending on quality.

The call for agricultural chemicals continues on a satisfactory scale, while in the market for coal tar products there has been a steady request for crude and refined tar and also the creosote oils.

**MANCHESTER** Activity this week in heavy chemical products has been steady, with both home consumers and exporters calling for regular supplies. The textile and allied trades and other industrial users are maintaining demands for the soda, potash and ammonia compounds, as well as for a wide range of general chemicals. On overseas account there is a steady movement to most Commonwealth outlets and the leading Continental markets. Quieter conditions are reported in fertilisers, but demand for tar products is steady.

**SCOTLAND** With a background of reasonably firm prices, a good steady volume of business has been transacted during the past week on the Scottish market. From most sections of industry demands have, apart from the usual basic heavy chemicals, covered quite a varied range. In regard to quantities these have been well maintained at normal levels. The position in regard to agricultural chemicals is unchanged with continued activity, particularly for immediate requirements. There has been quite a volume of inquiries for export.

### Measuring the Hydrogen Content of Steels

A NEW rapid technique for measuring the quantity of hydrogen dissolved in steels has recently been described by the British Welding Research Association. The new technique, described at a recent symposium on determination of gases in metals, organised jointly by the Iron and Steel Institute, the Institute of Metals and the Society for Analytical Chemistry, uses a carrier gas principle. In this, argon is passed over the sample of steel, which is heated in a furnace. The gas evolved is swept along to a hydrogen-sensitive cell from which the result is plotted directly on to an electrical graph recorder in the form of a peak. The system is said to be so accurate that as little as 1 p.p.m. hydrogen can be detected and measured.

Analysis time with this apparatus is 15 minutes compared with about 2 hours for the more usual instrument. A patent application has been made.

## TRADE NOTES

### Spectro-Chemical Analysis

A leaflet giving details of Elpac, with which powder samples for spectro-chemical analysis can be packed into carbon electrodes "quickly and consistently," is obtainable from Hilger and Watts Ltd., 98 St. Pancras Way, Camden Road, London N.W.1.

### Colours for Polythenes

A new range of non-dusting pigments has been developed by Geigy for the colouring of polyolefins. Exceptionally good dispersion is said to be obtained by the usual hot mixing methods or by dry tumbling. A minimum of mechanical work is required, and since mixing times are "exceptionally short" the heating cycle for pigment and polyolefin is greatly reduced. These advantages "go with improved colour yield and standardisation of shade from run to run."

### Kestner's Process Guide

To provide a handy hardwearing book for quick reference by process engineers, the Kestner Evaporator and Engineering Co. Ltd., 5 Grosvenor Gardens, London S.W.1, have published a fully documented, 44pp. pocket book. Sections include: crystallising and drying plant, evaporators and heat exchangers, fluid handling and laboratory and pilot plant, materials of construction, metal pickling and processing, process heating and special process plants. Copies will be sent on request.

### Flow Indicators

A leaflet, RP 2021, illustrating and describing a new type of flow indicator is available from Rotameter Manufacturing Co. Ltd., Purley Way, Croydon. The instruments are of non-ferrous construction, intended for use with air and non-corrosive gases only. Maximum working pressure is 100 p.s.i.

### Zerospot Additive

The automatic dispenser produced by Diversy (U.K.) Ltd., described in our 7 May issue (p. 774), is of course used for dispensing Zerospot, not Serospot, as stated.

### Drop Forge Lubrication

An illustrated leaflet entitled 'Foliac Colloidal Graphite . . . for drop forge die lubrication', is available from the Morgan Crucible Co. Ltd., Battersea Church Road, London S.W.11.

### Heat-welded Packaging Material

A laminate of long-fibred cotton cloth, sheet aluminium foil and polythene, now being marketed by Claritude Ltd., 19 Dunraven Street, London W.1 (a subsidiary of Saint-Gobin, Paris) is claimed to be a highly effective barrier material with uses including the packaging of chemicals and pharmaceuticals; explosives and cartridges; photographic materials and equipment; foodstuffs; machinery and components, etc. It is known as Silgelac and, when used as an outer wrapping, is stated to be extremely resistant to abrasion, crushing, rough handling and the weather. The envelope is sealed by heat-welding the edges with

a simple hand-tool. When the packaged goods have to be transported a long distance or stored, one or more dessicants (silica gel or activated clay) must be inserted in the envelope before sealing.

### Lower Acetone Price

A reduction in the price of acetone is announced by the Distillers Co. Ltd., Chemical Division, Devonshire House, Mayfair Place, London W.1. In bulk, minimum 2,500 gall. loads; £75 a ton (£83). In drums; in ton lots; £85 a ton (£90).

### Wiggin Alloys

New names for certain of their high-nickel alloys are announced by Herry Wiggin and Co. Ltd., Thames House, Millbank, London S.W.1. This re-naming has become necessary because of the wide diversity of compositions which have been developed over the last few years to meet specific material requirements. Further details are available from the company.

### Dunlop Chemical Products

The Dunlop Composition Division has been renamed Dunlop's Chemical Products Division. The new title more accurately describes the work now being carried out. From it there is a clear indication that an expansion of existing products and an extension into other lines can be expected. General manager of the division is Mr. N. G. Bassett Smith, this year's chairman of the British Rubber and Resin Adhesive Manufacturers' Association.

### Resin-Hardener System for the Paint Industry

THE paint industry has had experience over several years of solvent-thinned epoxide coatings which have been used successfully to protect metal surfaces against corrosion. In order to build sufficient film thickness, say about 0.005 in., to give adequate protection, it has been necessary to apply several coats of epoxide paint.

In contrast, however, a solventless liquid epoxide resin-hardener system will, it is claimed, provide a coating up to as much as 0.010-0.015 in. thick in one application and so eliminate the labour casts for multiple coats. A special epoxide resin/hardener system, DR.19156/DQ.19145, has been developed by Bakelite Ltd., 12-18 Grosvenor Gardens, London S.W.1, as the base for these solventless coatings.

## DIARY DATES

**WEDNESDAY 8 JUNE**  
S.A.C. with Inst. Petroleum.—Edinburgh: Three-day symposium on 'Gas chromatography'.

**THURSDAY 9 JUNE**  
British Food Manufacturing Industries Research Assn.—London: Hyde Park Hotel, Knightsbridge, S.W.1, 11.30 a.m. A.g.m., followed by reception and annual lunch.



# NEW PATENTS

By permission of the Controller, HM Stationery Office, the following extracts are reproduced from the 'Official Journal (Patents)', which is available from the Patent Office (Sales Branch), 25 Southampton Buildings, Chancery Lane, London W.C.2, price 3s 6d including postage; annual subscription £8 2s.

Specifications filed in connection with the acceptances in the following list will be open to public inspection on the dates shown. Opposition to the grant of a patent on any of the applications listed may be lodged by filing patents form 12 at any time within the prescribed period.

## ACCEPTANCES

### Open to public inspection 29 June

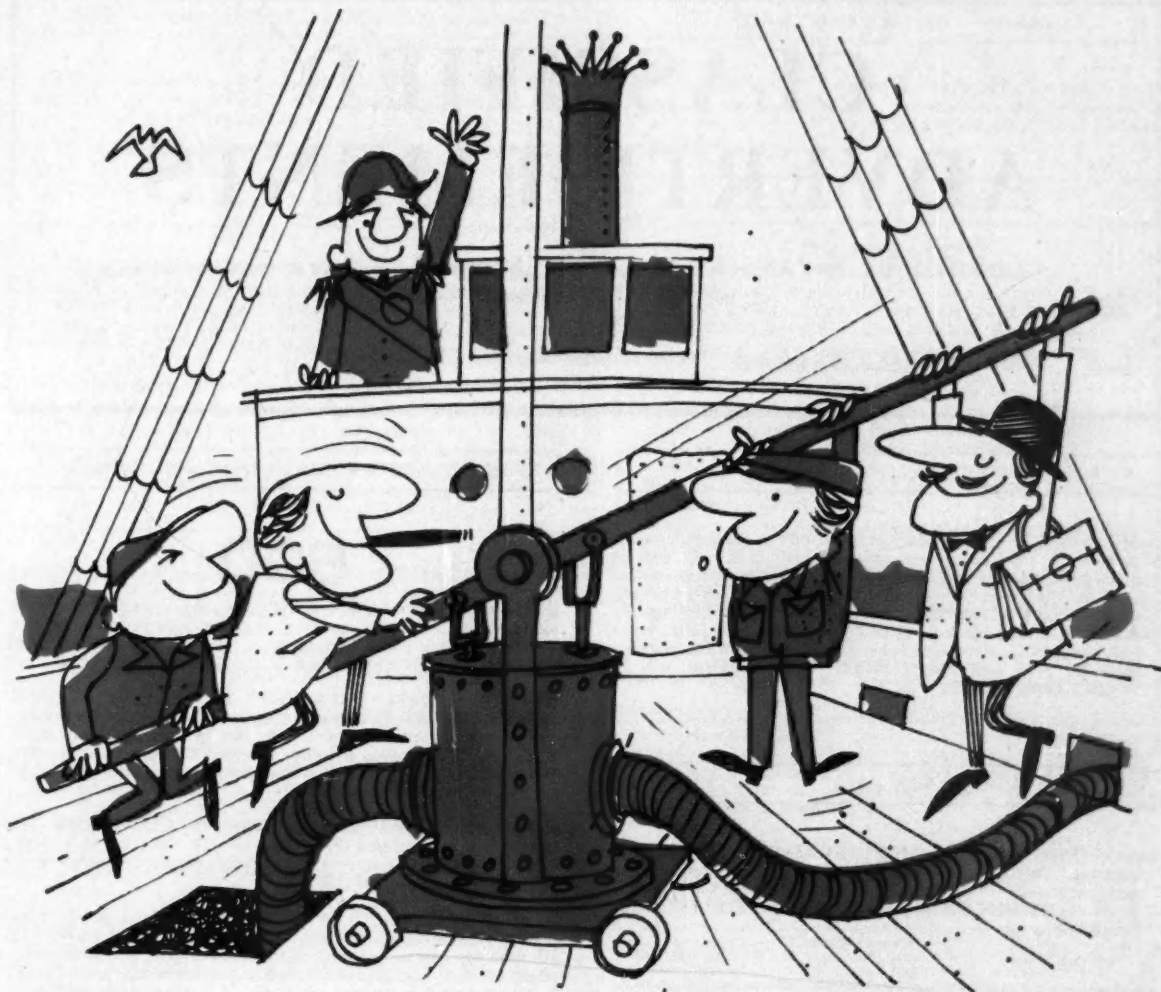
Tertiary carbinols and salts thereof and a process for the manufacture thereof. Hoffman-La Roche & Co. AG., F. **839 105**  
 Isomerisation of alkanes and catalysts thereof. Engelhard Industries Inc. **839 421**  
 Nitrogenous derivatives of dipentene having cytostatic action, and the production of the same. Badische Anilin- & Soda-Fabrik AG. **839 305**  
 Preparation of methylaromatic dicarboxylic acids. Olin Mathieson Chemical Corp. **839 738**  
 Processes for the preparation of alpha-hydroxy organic acids or esters thereof. Bataafsche Petroleum Maatschappij N.V., De. **839 831**  
 Process for producing aqueous alcohol from impure dilute aqueous solutions thereof. Usines de Melle. **839 423**  
 Polymerisation of ethylene. Soc. Air Liquide, Soc. Anon. pour L'Etude et L'Exploitation des Procédés G. Claude. **839 425**  
 N-substituted derivatives of dimiditriphosphoric acids and their production. Benckiser GmbH, J. A. **839 833**  
 Reserpine acid diesters and salts thereof and process for their manufacture. Ciba Ltd. [Addition to 744 290.] **839 313**  
 Derivatives of chloramphenicol. Zambon & C., SpA., G. **839 533**  
 Diaminonitropropionophenones and process for their preparation. Soc. Farmaceutica Italia. **839 028**  
 Nitration of O-toluic acid. Dow Chemical Co. **839 534**  
 5-Arylsulphonamido-3-substituted 1,2,4-thiadiazole derivatives. Farbenfabriken Bayer AG. **839 316**  
 Stabilised halogen-containing polymer compositions. Grace & Co., W. R. **839 074**  
 Production of dialkanolamines. Chemische Werke Hüls AG. **839 317**  
 Ammonium nitrate explosives and their manufacture. Canadian Industries Ltd. **839 078**  
 Hydrophenanthrene compounds. Reichstein, T. [Divided out of 839 746.] **839 747; 839 748**  
 Process for producing aromatic hydrocarbon distillates. Universal Oil Products Co. **839 120**  
 Process for the manufacture of aromatic hydrocarbons. Farbwerke Hoechst AG. **839 686**  
 Thiosilanes and method of production thereof. National Research Development Corp. [Divided out of 839 351.] **839 352**  
 Aliphatic xanthic esters and methods of production thereof. National Research Development Corp. [Divided out of 839 351.] **839 353**  
 Process for preparing halogenated hydrocarbons. Miller, W. T. [Divided out of 839 034.] **839 035**  
 Ternary alloy-containing plutonium. U.S. Atomic Energy Commission. **840 136**  
 Thionophosphoric acid esters. Farbenfabriken Bayer AG. **840 137**  
 Process for the production of urethane polyisocyanates. Mobay Chemical Co. **840 500**  
 Nitrogen-phosphorus containing polymeric products and method of making same. Benckiser GmbH, Chemische Fabrik, J. A. **840 142**  
 Diazotyped materials sensitised with N-hetero-p-aminobenzene-diazonium. General Aniline & Film Corp. **840 108**  
 Liquid hydrocarbon conversion process. Esso Research & Engineering Co. **840 104**  
 Polyester resins. Koninklijke Industriële Maatschappij Voorheen Noury & Van Der Lande N.V. **840 201**  
 Diamine salts and polymers thereof. Uclaf. **840 204**

Apparatus for the production of hydrogen chloride and for the absorption of the same to form hydrochloric acid or for the direct recovery of hydrogen chloride in cooled state. Badische Anilin- & Soda-Fabrik AG. **840 205**  
 Process for the production of triphenyl triazine tricarboxylic acids. Deutsche Gold und Silber Scheideanstalt vorm. Roessler. **840 209**  
 Hydroxymethyl derivatives of resorcinol and their production. Soc. des Usines Chimiques Rhone-Poulenc. **840 150**  
 N-carbonyl sulphamic acid fluoride and a process for its production. Farbenfabriken Bayer AG. **840 214**  
 Method for the preparation of pigmented polyesters and articles manufactured from these polyesters. Onderzoekingsinstituut Research N.V. **840 215**  
 Alkoxyphenyl esters of aryl (cyclic amino) methanols. Searle & Co., G. D. **840 704**  
 Morpholinoacyl anilides and methods for their preparation. Astra Apotekarnes Kemiska Fabriker A.B. **840 361**  
 Curing polyester resins. Allied Chemical Corp. **840 021**  
 Purification of uranium-bearing materials. Union Carbide Corp. **840 160**  
 Method for the preparation of 1,3,5-triphenyl benzene. Rutgerswerke-AG. **840 022**  
 Hydroforming catalyst and process. Esso Research & Engineering Co. **840 077**  
 Production of titanium. New Jersey Zinc Co. **840 162**  
 Process for the production of L-erythro-5-amino-6-phenyl-1,3-dioxanes. Boehringer & Soehne GmbH, C. F. **840 365**  
 Production of nitrogen trifluoride electrolytically. Schmeisser, M. **840 026**  
 Process for the manufacture of isoprene. Scientific Design Co. Inc. **840 028**  
 3:5:4'-tribromosalicylanilide and its use as a soap germicide. Unilever Ltd. **840 366**  
 Fluorine-containing polymers and their production. Du Pont de Nemours & Co. E. I. **840 080**  
 Reinforced resinous polymers. Esso Research & Engineering Co. **840 367**  
 Production of alkyls. Badische Anilin- & Soda-Fabrik AG. **840 619**  
 Process for the preparation of diolefins by dehydrogenation of monoolefins. Bataafsche Petroleum Maatschappij N.V., De. **840 082**  
 Method of preparing 1,4-trans polyisoprene. Goodyear Tire & Rubber Co. **840 165**  
 Production of polymeric phosphams. Benckiser GmbH Chemische Fabrik J. A. [Divided out of 840 386.] **840 387**

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Separation of uranium, plutonium and fission products. Nicholls, C. M., Wells, I., and Spence, R. **840 105**  
 Organic isothiocyanates. Boots Pure Drug Co. Ltd. **840 121**  
 Methods of preparing polyurethane resins and intermediate compositions therefor. Beck & Co. GmbH. **840 089**  
 Method for obtaining monohydrated ferrous sulphate. Ateliers J. Hanrez SA. **840 376**  
 Purification of polyolefins obtained by low-pressure olefin polymerisation processes. Bataafsche Petroleum Maatschappij N.V., De. **840 314**  
 Process of perfluoroalkylating aromatic compounds. Minnesota Mining & Manufacturing Co. **840 725**  
 Process for improving polyolefins. Farbwerke Hoechst AG. **840 726**  
 Processes for purifying silicon and/or germanium alloys or compounds of silicon and/or germanium. Siemens & Halske AG. **840 729**  
 Process for the polymerisation of olefins. Bergwerks-Gesellschaft Hibernia AG. **840 730**  
 Stabilisation of sulphur trioxides. Manufactures des Glaces et Produits Chimiques de Saint Gobain, Chauny & Cirey S.A. des. **840 379 & 840 657**  
 Manufacture of thiolactones. Goodrich Co., B. F. **840 658**  
 Process for the preparation of cyclopentanophenanthrene derivatives. Syntex S.A. **840 659**  
 Process for working up polyolefins. Farbwerke Hoechst AG. **840 691**  
 Fluorine-containing polymers. Minnesota Mining & Manufacturing Co. **840 735**  
 Keto-piperazines. Geigy AG., J. R. **840 094**

Modification of polymers containing bonded hydrogen atoms. Du Pont of Canada Ltd., formerly Du Pont of Canada (1956) Ltd. **840 033**  
 Aqueous dispersions of elastomeric polymers. Goodrich Co., B. F. **840 093**  
 N-(vinylalkyl) amidoguanamines, their polymers and copolymers and the preparation thereof. Rohm & Haas Co. **840 169**  
 Vinylalkylamido-nitriles and preparation thereof. Rohm & Haas Co. **840 170**  
 Process for compressing gases containing hydrogen sulphide and nitric oxide. Koppers GmbH, H. **840 036**  
 Process for the production of masked isocyanate compounds which are soluble in organic solvents and a process for the manufacture of two-dimensional formations such as lacquers, films, coatings and impregnating layers. Farbenfabriken Bayer AG. **840 318**  
 Soluble silicates. Unilever Ltd. **840 039**  
 Cellulose esters. Celanese Corp. of America. **840 319**  
 Process for the production of naphthalene-aldehyde condensation polymers. Gelsenkirchener Bergwerks-AG. **840 320**  
 Process for the preparation of cyclic dibasic acids and their salts. Henkel & Cie GmbH. **840 040**  
 Organic sulphonamido isothiocyanates. Boots Pure Drug Co. Ltd. [Divided out of 840 121.] **840 122**  
 Production of expanded thermoplastic resins. Badische Anilin- & Soda-Fabrik AG. **840 663**  
 Polymerisation catalysts. Imperial Chemical Industries Ltd. **840 327**  
 Method of and apparatus for reforming hydrocarbon gases. Stein & Roubaix. [Addition to 818 061.] **840 120**  
 Hemicyanine dyestuffs. Ilford Ltd. **840 384**  
 After-treatment of vinylidene cyanide interpolymer. Goodrich Co., B. F. **840 331**  
 Preparation of amido derivative of emidipolyphosphoric acids. Benckiser GmbH, Chemische Fabrik, J. A. **840 386**  
 Process for the production of synthetic resins. Henkel & Cie GmbH. **840 334**  
 Process and apparatus for producing carbon black and carbon black so produced. Phillips Petroleum Co. **840 336**  
 Treatment of polymers. Imperial Chemical Industries Co. Ltd. **840 497**  
 Dispersing gases in liquids. Imperial Chemical Industries Ltd. **840 680**  
 Electrodeposition of copper. Minister of National Defence of Her Majesty's Canadian Government. **840 429**  
 Water-soluble steroids and pharmaceutical compositions containing them. Merck & Co. Inc. **840 430**  
 Process for the manufacture of di-imidazole derivatives. Ciba Ltd. **840 341**  
 Titanium base vanadium-iron-aluminium alloys. Mallory-Sharon Metals Corp., formerly Mallory-Sharon Titanium Corp. **840 393**  
 Process for the manufacture of anhydrosulfoxide dyestuffs. Imperial Chemical Industries Ltd. **840 223**  
 Production of organic phosphorus compounds. Metal & Thermit Corp. **840 438**  
 Vulcanising brominated polymers. Esso Research & Engineering Co. [Addition to 799 193 and 815 939.] **840 005**  
 Process for desulphurising catalytically cracked distillate oils. British Petroleum Co. Ltd., Moy, J. A. E., and Mather, J. **840 124**  
 Method and apparatus for controlling a catalytic reaction system. Phillips Petroleum Co. **840 225**  
 Synthesis of substituted piperidines. Merck & Co. Inc. **840 096**  
 Oxidation of organic compounds. Imperial Chemical Industries Ltd. **840 009 & 840 130**  
 Process for reducing the harmful effect of combustion gases. Esso Research & Engineering Co. **840 351**  
 Process of purifying terpene polymer containing halide impurities. Schenectady Varnish Co. Inc. **840 445**  
 Amines of therapeutic utility. May & Baker Ltd. **840 446**  
 Divinyl tin oxide and a process for its preparation. Metal & Thermit Corp. **840 448**  
 Trivinyltin hydroxide and a process for its preparation. Metal & Thermit Corp. **840 048**  
 Films of polypropylene. Imperial Chemical Industries Ltd. **840 191**  
 Preparation of aluminium alcoholates. Armour & Co. **840 449**  
 Polymerisation of ethylene. Du Pont de Nemours & Co. E. I. **840 453**  
 Manufacture of N-mono-substituted piperazines. British Drug Houses Ltd. **840 358**



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**TENDERS**

The Directorate of Army Contracts desires to extend its lists of firms eligible to be invited to tender for the supply of small quantities of lubricating oil packed in one ounce bottles and small quantities of grease packed in ½ oz tubes, or for the packing of W.D. oil and grease into containers of the sizes mentioned.

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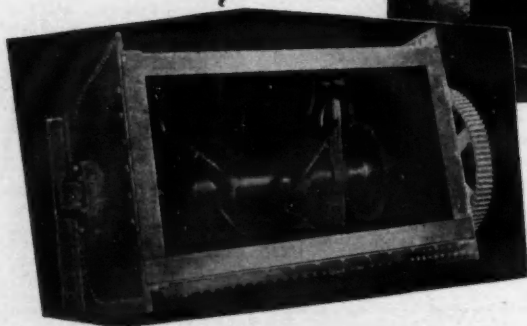
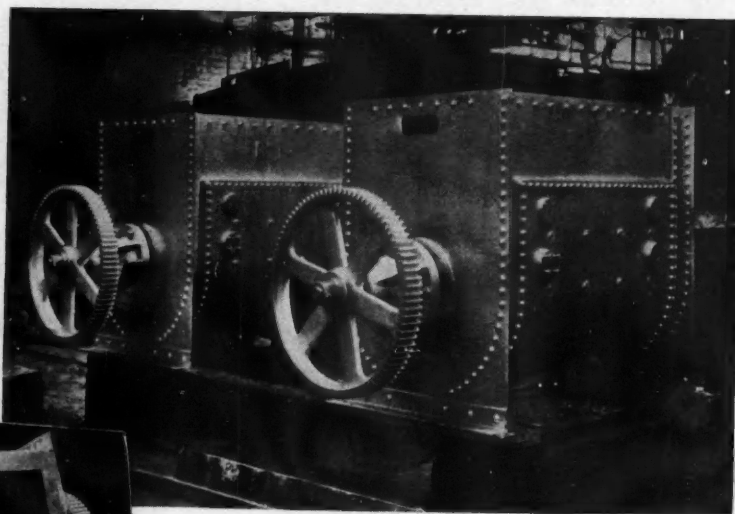
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